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Maine Agricultural Experiment Station

ORONO

BULLETIN No. 220. NOVEMBER, 1913

WOOLLY APHID OF THE ELM

CONTENTS.

This bulletin contains a treatment of the elm aphids of Eastern United States belonging to the genus Schizoneura, accompanied by a list of aphids recorded from other parts of the world on certain plants including the elm.

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BULLETIN No. 220

WOOLLY APHIDS OF THE ELM.*

EDITH M. PATCH.

Since the publication of Bulletin 203 about one year ago, the elm aphids belonging to the genus *Schizoneura* have been making such rapid history that that publication is not only out of print but also out of date. It is the purpose of Bulletin 217 and the present paper to bring together what information I have on this group of elm aphids, more as a report of progress in order to clear away certain previous confusions than as an attempt at a complete treatment.

I have received very considerable aid in this study from entomologists in widely separated parts of this and other countries and express my appreciation of such help in general rather than in specific terms, not from any desire to assume credit for data worked in accordance with suggestions from others but in order that no one else need find himself made responsible for the manner in which these fragments are presented.

While it is to be regretted that we have not the total stories of all the species discussed it seems wise to bring the account up to date, trusting that the missing links will be forthcoming sometime, somewhere.

The present discussion takes no account of such species as have as yet been collected only in the far West as those can most fittingly be introduced by the entomologists who have been observing them at close range.

Among the points of specific value in separating these aphids are the antenna of the stem females with especial reference to

* Papers from the Maine Agricultural Experiment Station: Entomology No. 68.

the relative length of the joints, the wax glands of the apterous generations other than the stem mother, and the antennal characters of the winged females. The habitat and the species of the elm concerned are also of much significance.

The text figures of antennæ in this bulletin are all drawn to the same scale.

Woolly Aphid of Elm Bark.

(*Schizoneura rileyi.*)

It is not uncommon to find the trunks and branches of young elms with tender places in the bark closely packed with colonies such as are shown in Figure 140. That Riley was correct in describing this as a distinct species a further acquaintance with the aphids leads me to believe. The stem mother has joint III of antenna conspicuously shorter than those of the "leaf roll" or "rosette." The wax glands of the second generation are of a type similar to *lanigera* but with a tendency to a larger central area. The antenna of the winged forms has joint III with the annulations less symmetrical than the other elm *Schizoneurans,* and the grooves between the annulations are of more varying depths.

There are several matters of biological interest in connection with this aphid which set it apart from any other species I know at present. Winged forms are developed both in June and in August, but both are developed on the elm. Whether they have lost their function as migrants altogether, whether they simply take wing to other elms, or whether there is a kink in the total life cycle of this insect which we have not yet learned, I do not know.

On September 23, 1908, I made a collection of apterous viviparous forms which gave birth to the true sexes. As in this genus, so far as I know, the mothers of the sexual generation are in other cases winged this seems peculiar. Individuals were inclosed in vials with bits of cloth and the records carefully taken so there could have been no mistake.

The minute apterous oviparous females are born with a beak which is lost with the molt. They have a 5-jointed antenna. Total length of body 0.8 mm. This form lays but a single egg.

The apterous males are but 0.55 mm. long and their bodies are slender. Their antennæ and legs are relatively much longer than those of the female. Antennæ are 5-jointed. Mature male without beak, this being lost at molt. Described from specimens taken September 23, 1908. Maine collection number, 89-08.

Antennal drawings of different forms are given here for comparison with the other species.

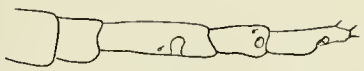


Fig. 119. The antenna of the stem mother of *rileyi* is distinguished at once from those of the curl and rosette dwellers by the difference in length, it being much shorter in this species. It is normally a 5-jointed structure but there is frequently a clear spot in III as shown in this figure which seems to be a vestigial indication of another joint. (52-13).

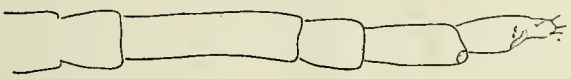


Fig. 120. Evidently a part at least of the second generation become winged as winged forms are present by the middle of June at which time the stem mother is still actively producing nymphs. The antenna of the pupa is given in this figure. (7-08). It is characterized by a rather short bulged IV.

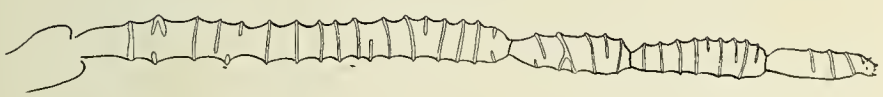


Fig. 121. The antenna of the spring winged generation is characterized by having wider spaces between the annulations on III than is usual for the curl and rosette dwellers, and with less symmetry as to the antennal grooves. Annulations are com-

mon on VI. The antenna of this generation is practically the same in appearance as that of the fall winged generation. (7-08).

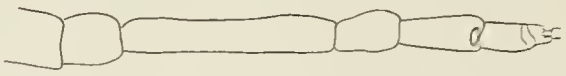


Fig. 122. The antenna of an apterous viviparous form giving birth to the true sexes. (89-08). The relative length of the joints are approximately the same as those of the pupa.

The following collection notes are perhaps worth keeping as a part of the discussion of this species:

Aphid 69-05. September 2, 1905. Present in great numbers in woolly clusters along trunk of small elms at Orono. Apterous viviparous form and nymphs. This material was determined by Mr. Pergande as *Schizoneura rileyi* during the winter of 1905-06.

Aphid 95-06. August 4, 1906. Orono. Apterous and alate forms present on trunk of young elm.

Aphid 7-08. June 16, 1908. Woolly mass on trunk of small elms. Winged viviparous forms just developing from pupæ.

Aphid 89-08. Sept. 23, 1908. Orono. Apterous viviparous forms in woolly bunches on trunk and branches of young *Ulmus americana*, causing knotty growth. The progeny of these apterous forms were the true sexes,—apterous oviparous females and apterous males. Eggs were plentiful under the bark.

Aphid 52-13. June 14, 1913, Orono. Colonies in tender places on trunk of young elms (*Ulmus americana*). Stem mothers, nymphs and pupæ.

BIBLIOGRAPHY.*

1868. (1869). *Eriosoma ulmi* Riley; Rept. Ins. Mo. 1 : 123, 124. Account of work and original description of winged forms and young lice. Remedies.

1876-1879. *Schizoneura rileyi* Thomas. Trans. Ill. Hort. Soc. 1876. p. 191; id. Rept. Ent. Ill. 8 : 136, 137, 1879, nom. nov. for Eriosoma ulmi Riley. Systematic discussion and description of work. Description of insect quoted from Riley.

1885. *Schizoneura rileyi* Lichtenstein Monograph (528).

1885. *Schizoneura rileyi*, Forbes. Rept. Ent. Ill. 14 : 114.

* No attempt has been made to give a complete bibliography for any species in this paper.

1888. *Schizoneura rileyi* Lintner. 3rd Report, p. 125.
1890. *Schizoneura rileyi,* Packard. Fifth Rept. U. S. Entom. Com. Wash. Original description of insect quoted.
1897. *Schizoneura rileyi,* Lintner. 13th Report, p. 374. Mere mention.
1901. *Schizoneura rileyi,* Hunter. Aphid of N. A., p. 84. Bibliography in part.
1905. *Schizoneura rileyi,* Felt, N. Y. St. Mus. Memoir 8: pp. 172, 192. Brief description of work and remedies.
1909. *Schizoneura rileyi,* Gillette. Journal Ec. Ent., p. 357.
1910. *Schizoneura rileyi,* Patch. Bul. 181, Me. Agr. Exp. Sta.
1910. *Schizoneura rileyi,* Williams. The Aphididae of Nebraska, p. 20.
1910. *Schizoneura rileyi,* Davis. Journ. Ec. Ent. p. 413.
1913. *Schizoneura* from elm bark. Patch Annals Ent. Soc. America. Plate 24, Figs. 19, 20, 21, 22.

A New Elm Gall for America.

Schizoneura lanuginosa?

A gall unlike any I have seen before was sent me last August from Connecticut by Doctor Britton. It was deserted and brown and dry, but as Figure 139C will show it resembles the pictures by Buckton of *lanuginosa* so closely that it seems probable that it is that species. The gall was apparently an out growth from the twig at the base of the petiole, resulting in the extreme dwarfing of the nearest leaves. It is figured here merely to call attention to the occurrence of such a gall in New England in hopes that specimens may be collected earlier another season before the migrants have taken wing.

BIBLIOGRAPHY.

Schizoneura lanuginosa Htg.

1841. *Schizoneura lanuginosa,* Hartig, Versuch einer Einteilung der Pflanzenlause. Germar's Zeitschr. f. Entomologie, Bd. III, p. 367.
1843. *Schizoneura lanuginosa,* Kaltenbach, Monogr. d. Fam. d. Pflanzenlause p. 170.
1857. *Schizoneura lanuginosa,* Koch. Die Pflanzenlause, p. 264, Fig. 339, 340.
1863. *Schizoneura lanuginosa,* Passerini, Aphididae italicae, p. 70.
1881. *Schizoneura lanuginosa,* Buckton, Monogr. of Brit. Aphides, Vol. III, p. 104, Pl. CIX, Fig. 5-10.
1885. *Schizoneura lanuginosa,* Lichtenstein, Monograph (324).
1887. *Schizoneura lanuginosa,* Horvath, Math. term. ert. V pp. 130-136.

1893. *Schizoneura lanuginosa,* Rey, Exchange, p. 62.
1900. *Schizoneura lanuginosa,* Del Guercio, Prosp. dell' afidofauna italica, Nuov. relaz. Ser. I, 2. p. 104.
1909. *Schizoneura lanuginosa,* Tullgren. Aphid. Stud. Uppsala. p. 170. Fig. 83.
1909 (1910) *Schizoneura lanuginosa,* Henrich. Die Blattlause der Umgebung von Hermannstadt.

Elm Rosette or Leaf Cluster Aphid.

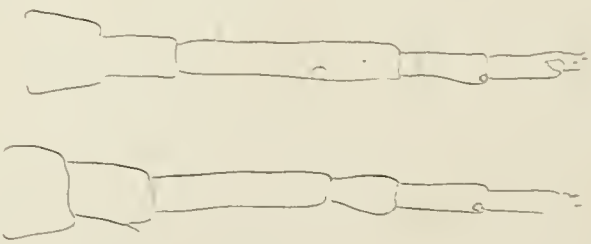
Schizoneura lanigera (americana in part of authors).

This aphid and the next succeeding are treated in Bulletin 217. I do not know whether the two are distinct, but from the appearance and the behavior of the summer generations of both on *Pyrus* and the antennal characters of the fall migrants do not feel that there is any basis of separating them except as to the nature of their elm habitat.

The antenna of different generations of the rosette aphid. (Figs. 123 to 128) together with some details as to wax glands (Fig. 143 D. J. K.) are given for comparison with the other elm aphids.

This migrates normally to *Pyrus* in Maine the spring migrants from the elm leaves settling on the under side of the leaves of mountain ash and apple, and their immediate progeny creeping to stems of water shoots or tender places in the bark before feeding. Such normal out of door colonies which were watched carefully during their origin are shown in Fig. 78 in Bulletin 217 of this Station. I have also reared the progeny of the spring migrants on mountain ash in confinement, such a colony being shown in Fig. 60 in Bulletin 217.

It is abundant in both Maine and Colorado and doubtless all the way between.



Figs. 123 and 124. Antennæ of stem mother from rosette. The antenna of this form is normally 5-jointed with a trans-

parent place varying in shape and size on III that seems to be a vestigial indication of another joint. Indeed 6-jointed antennæ for this form are by no means rare and it sometimes happens that a specimen will have one 5-jointed antenna and the other distinctly 6-jointed. (33-13).

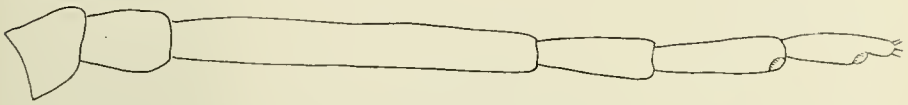


Fig. 125. The antenna of the rosette aphid, second generation, apterous viviparous. (33A-13). Typically this has III as long as or longer than IV+V+VI, and in this respect resembles the antenna of the winged form of this species.

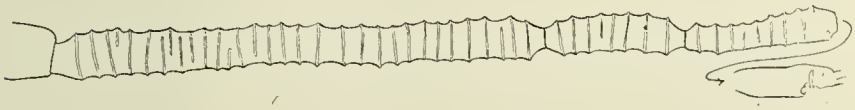
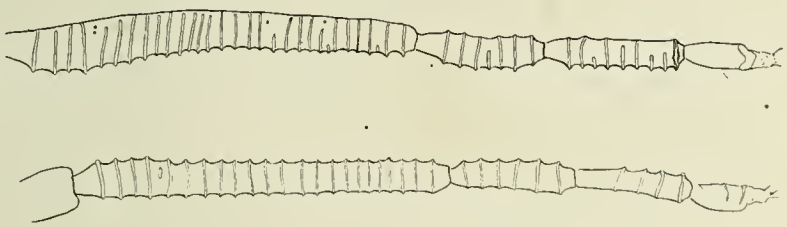


Fig. 126. Antenna of spring migrant from rosette,—one of the collection whose progeny colonized the seedling mountain ash as shown in Bulletin 217, Fig. 69. (57-13).



Figs. 127 and 128. Antennæ of spring migrants from rosette collected July 10, 1912, from under side of mountain ash leaf in the open where they were settled and producing progeny. (See Fig. 78, Bulletin 217) Ordinarily VI is without annulations but these sometimes are present as is shown in Fig. 128. (60-12).

Fig. 129. Antenna of fall migrant collected from hawthorn, *Crataegus*. (114-06).

Fig. 130. Antenna of fall migrant collected from mountain ash. *Pyrus* sp. Typically VI is with two or more annulations, but these are sometimes lacking. (63-11).

BIBLIOGRAPHY.

1879. *Schizoneura americana,* Riley. (in part?) Bulletin. U. S. Geol. & Geograph. Survey Vol. V, No. 1, "the deformation assumes various distorted shapes, sometimes involving quite large masses of the leaves."

1897. *Schizoneura americana,* Gillette. (in part?). Bul. Div. Ent. U. S. Dept. Agric. 9. pp. 78-79. "The attack begins with the opening of the first buds, when the little, wrinkled clusters of leaves begin to appear from the terminal buds of small twigs upon the trunk and large branches of the tree."

1898. *Schizoneura americana,* Gillette. (in part.) Bul. A. E. S. Colo. 47. p. 35 and Fig. 32. "The Elm Leaf-cluster Gall.

1899 (1900). *Schizoneura americana.* Harvey. Bul. Me. Agr. Exp. Sta. No. 61. p. 32. Figure.

1900. *Schizoneura americana.* Lugger (in part). Bul. No. 69. Minn. Agr. Exp. Sta. Id. 6th Ann. Rept St. Ent. of the St. Exp. Sta. Univ. of Minn. p. 169. "If at all numerous they can greatly deform the ends of the twigs, where all the leaves are curled, forming a mass of sickly, yellowish leaves."

1904. *Schizoneura americana* (in part). Sanborn. Kansas Aphid. p. 25. "When numerous they give the leaves a whitish appearance and cause the terminal ones to bunch together, which gives the lice more protection."

1909. *Schizoneura ulmi* (*americana*). Gillette. Jour. Ec. Ent. Oct. Fig. 16. Antenna.

1910. *Schizoneura americana* (in part). Patch. Bul. 181. Me. Agr. Exp. Sta. Fig. 151.

1912. *Schizoneura lanigera* (*americana*). Patch. Woolly aphid migration from elm to mountain ash. Jour. Ec. Ent. pp. 395-398. Figure 2.

1912. *Schizoneura lanigera* (*americana* in part). Patch. Bul. 203. Me. Agr. Exp. Sta.

1913. *Schizoneura* sp. Gillette. 25th Ann. Rept. of the Col. Agr. Exp. Sta. p. 30. "the form producing the rosette like cluster of leaves at the tip of elm twigs."

1913. *Schizoneura* sp. Patch. Ann. Ent. Soc. Am. Figs. 68 to 82.
1913. *Schizoneura lanigera*. Patch. Bul. 217. Me. Agr. Exp. Sta. Figs. 69, 70, 71, 72, 78, 79, 80, 81.

Southern Elm Leaf Curl.

Schizoneura lanigera (*americana* in part of authors).

My acquaintance with this form is limited to material sent me from the south the spring of 1912. I am not sure of the species of *Ulmus* it was taken on, but think it was *americana*.

Photographs of the curl and the woolly colony on apple, bred from migrants of this form are given as Figures 67 and 68 of Bulletin 217.

Fig. 131 represents the antenna of the fall migrant (*sexupara*) of the same bred colony. (9-12 sub. 1.)

It will be seen that this has the same characteristics as the corresponding form taken on *Pyrus* or *Crataegus* out of doors as shown in Figures 129 and 130. It is smaller than many of the out door grown individuals but the overstocked and dwarfed little seedling on which it developed may well be responsible for the size of the insects which were reared through the several generations from the spring migrants in confinement on the same potted apple in confinement.

BIBLIOGRAPHY.

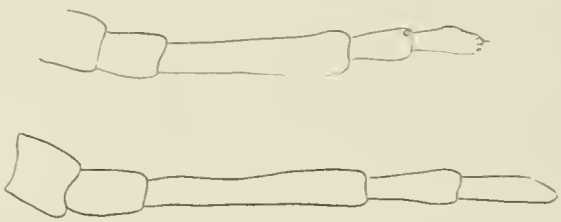
1912. *S. lanigera* (*americana*), Patch. Science Vol. 36 pp. 30-31.
1912. *S. lanigera* (*americana*). Patch. Journal Economic Entomology Vol. 5, p. 396. (first paragraph of page).
1912. *S. lanigera* (*americana*), Patch. Bul. 203. Me. Agr. Exp. Sta. Top of page 237 and Fig. 448.
1913. *S. lanigera* (*americana*). Patch. Journal Economic Entomology. Vol. 6, pp. 316-318.
1913. *Schizoneura*. Patch. Annals Entomological Society America. Vol. 6, Plate 24. Fig. 11 and Plate 25. Fig. 27.
1913. *S. lanigera* (*americana* in part). Patch. Bul. 217. Me. Agr. Exp. Sta. Figs. 67 and 68.

Northern Curl of American Elm.

Schizoneura americana in part, of authors.

The popular name here applied to this species may be unfortunate as the same insect exists also in the south, but it is apparently the most common aphid in the northern states inhabiting the roll or curl type of leaf deformation on *Ulmus americana*.

The stem mother matures in Maine early in June, in the young roll. (Fig. 139A) At this time she is somewhat powdery but if removed from the curl and examined in sunlight with a lens her body is found to have a distinctly greenish cast. When mounted alive on a slide in balsam there is no dark reddish stain though the balsam may be slightly yellowed. This species may be distinguished by these signs from the rosette dweller which shows distinctly reddish in the sunlight and stains the balsam a deep red when mounted alive.



Figs. 132 and 133 show the antenna of this form which resembles that of the rosette species closely. Indeed the antennal joints of the first generation of both these species vary enough in different individuals to make this structure of little value in separating the curl and the rosette species in this stage. (32-13 and 32A-13).

The second apterous generations however, are readily distinguished by their wax glands, those of this curl dweller being arranged in an irregular rather elongate mass and not placed about a clear central area as in the case of the rosette dweller.

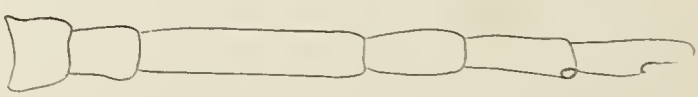


Fig. 134. The antenna of this generation is 6-jointed and distinguished from that of the rosette dweller in having III typically shorter than IV+V+VI. (32A-13.) This generation matures about June 17 in Maine.

Whether the migrant generation maturing late in June are altogether the progeny of the second apterous generation or in part the daughters of the stem mother I do not know. My field observations lead me to think that part of the progeny of the second apterous generation desert the elm leaves and settle under the scales of the elm bark in tender places on the trunk and there subsist as bark feeders in woolly colonies but less conspicuous and more hidden than *rileyi*. At any rate such bark colonies occur here in Maine for which I can not otherwise account.

The fact that the stem mother is still actively giving birth to nymphs for some time after the second apterous generation become mature and are producing young complicates the case considerably when an attempt is made to sort out the young. Figure 139B shows an old roll just deserted by the migrants.

Fig. 135. The antenna of the spring migrant. It is typical for this structure to have III shorter than IV+V+VI and VI subequal to or even longer than V. The length of VI, however, is variable in Maine material and is apparently ordinarily a little shorter than with the same species as it occurs in the western states. The number of annulations on III is also subject to considerable variation. The antennæ of those individuals developing in leaf curl late after the leaf becomes less sappy are likely to differ very strikingly from those developing earlier in the season both in total length of antenna and in the number and distribution of the annulations, as is illustrated in Annals Entomological Society of America, Vol. 6, Plate 24. Figs. 2, 6 and 7 are all drawn to the same scale. Figs. 6 and 7 represent the antenna of individuals collected July 23, 1912 for comparison with specimens, Fig. 2 which developed June 30 in the same leaf rolls. The difference in the total size of the antennæ and in the

number of annulations of the big thrifty early ones from the juicy leaf and the last individuals to develop in the drying roll would seem suggestive of the physiological effect of the habitat on the size of the individual and the character of the antenna. (68-13.)

The migration of this winged generation from the leaf curl is a matter of frequent record and easy to observe. Where it goes and what the food plant of its summer progeny is still unknown. During 1912 a few individuals of this species were taken in the open on *Pyrus* leaves together with the rosette dweller, but a further acquaintance with the elm *Schizoneurans* leads me to believe that they had merely alighted there accidentally on the way to their proper host.

A fall migrant is found on the elm whose antenna accords with that of the spring migrant of this species and is probably the return migrant. Neither the spring nor fall winged forms have the antenna of *lanigera* and the wax glands of the second generation distinguish it from that *Ulmus-Pyrus* species.

BIBLIOGRAPHY.

1879. *Schizoneura americana* in part. Riley. Bul. U. S. Geo. and Geograph. Survey. Vol. V. No. 1. pp. 4-9 and Plate I and Fig. 2. description of seven generations on elm. Riley evidently included both the rosette and roll species under one name as his followers have for years. Whether he included more than two species it would be difficult now to ascertain. His figure of the antenna of the winged form with VI long and heavily annulated is evidently either an error or else this represents some elm *Schizoneuran* not at present known.

1879. *Schizoneura americana* in part. Thomas (in part). Report of the State Entomologist Ill. VIII. p. 202. Quotes Riley's description.

1887. *Schizoneura americana*. Oestlund. O. W.. (in part). Aphid. Minn. p. 27. Description of winged form and pseudo gall.

1890. *Schizoneura americana* Packard. (in part). Fifth Rept. U. S. Entom. Com. p. 279. Extract from Riley Bul. U. S. Geol. and Geograph. Survey. Vol. V. No. 1.

1897. *Schizoneura americana*. Gillette. C. P.. (in part?). Bul. Div. Ent. U. S. Dept. Agric. 9 (n. s.): 78-79. Description of work.

1900. *Schizoneura americana*. Lugger. (in part). Bul. No. 69. Minn. Agr. Exp. Sta. Id. 6th Ann. Rept. St. Ent. of the St. Exp. Sta. Univ. of Minn. pp. 168. 169. Fig. 148 after Riley.

1901. *Schizaneura americana,* Aldrich. Idaho Agric. Exp. Sta. Feby. Bul. 26, pp. 20-22. Records summer and fall (return) migration and describes true sexes. Suggests that alternate host plant may be grass.

1902. *Schizaneura americana,* Weed, C. M. Bul. No. 90. N. H. Agr. Exp. Sta. p. 37. Brief account and photograph of curled leaf.

1902. *Schizaneura americana,* Cook, M. T. Galls and Insects Producing Them. Ohio Naturalist. Vol. II, No. 7, p. 265 and Fig. 12. Discussion of structure of gall.

1904. *Schizoneura americana,* Sanborn, C. E. (in part). Kansas Aphid pp. 25-26.

1904. *Schizaneura americana,* Cooley, R. A. 10th Ann. Rept. Mont. Agr. Exp. Sta. pp. 43-45. Records this insect as a decidedly obnoxious pest in some parts of Montana on *Ulmus americana.*

1905. *Schizoneura americana,* Felt, E. P., (in part). N. Y. St. Mus. Memoir 8: pp. 172, 177-178. Description of leaf curl, and life history adapted from Riley.

1909. *Schizoneura ulmi* L. (*americana* Riley) Gillette, C. P. (in part). Journal Ec. Ent. Vol. 2, p. 356.

1910. *Schizaneura americana,* Patch, Edith M. (in part). Gall Aphids of the Elm. Me. Agr. Exp. Sta. Bul. 181, pp. 223-235.

1910. *Schizoneura americana,* Williams, T. A. (in part). The Aphididæ of Nebraska, p. 16.

1913. *Schizoneura americana,* Gillette. 25th Ann. Rept. of the Col. Agr. Exp. Sta. p. 30. "the leaf-rolling form" distinguished from "the form producing the rosette like cluster of leaves at the tip of elm twigs."

1913. *Schizoneura* sp. Patch. Ann. Ent. Soc. Am. Figs. 1 to 7.

1913. *Schizaneura americana* in part, of authors. Patch. Bul. 217. Me. Agr. Exp. Sta. p. 184. Habitat Key for Woolly Aphids of the Elm.

Elm-Currant Aphid of Europe.

Schizoneura ulmi (fodiens).

There is apparently little doubt that the literature for *ulmi* in Europe is as mixed as that for *americana* in this country, both being what is known as composite species. What *ulmi* of Linn. was is perhaps past finding out but however that may be that species which migrates to *Ribes* where it was known as *fodiens* evidently has as good a right to the name as any, and most of the recognizable figures are those of the *Ulmus-Ribes* species. That the life cycle of this leaf roller of elms (*Ulmus scabra, U. campestris, U. racemosa* and perhaps others) includes a residence on the roots of currants or gooseberries has been definitely

established for Europe. Although the life cycle has not yet been followed through in America, specimens which I have seen collected from California, Oregon, Maine (1913), and Ontario (fall migrants, 1913) are, I believe, identical with *ulmi* (*fodiens*) of other countries and will doubtless prove to have the same cycle here. As will be seen from figure 138A and B the roll caused by *ulmi* is of the same type as that caused by *americana*, and as both species extend from Maine to California it is not unlikely that they have been confused in our literature. So far as I know at present *S. ulmi* from *Ulmus americana* is not recorded nor *S. americana* on the species of elm accepted by *S. ulmi*, but this whole question needs further study.

The first collection of this species made in Maine was at Bath June 23, 1913, when a box of the leaves containing stem mothers, pupæ and migrants were received with the statement that more than a bushel of such leaves had been taken from a Camperdown elm (*Ulmus scabra* Mill. var. *pendula*). Another collection from the same place was secured July 8.

On August 31, 1913, while in Bar Harbor I collected curled leaves from an English elm (*Ulmus campestris*) which contained molted pupal skins, the antennal structure of which proved the work to be that of *ulmi*. No live specimens were present, of course, at that date. The infested elm, though a good sized tree, had hardly a normal leaf. However much alike their rolls look the insects inside are readily distinguished in all their stages.

Fig. 136. The antenna of the stem mother. It is at once distinguished from that of the corresponding form of the other species treated in this paper by the very much abbreviated terminal joint.

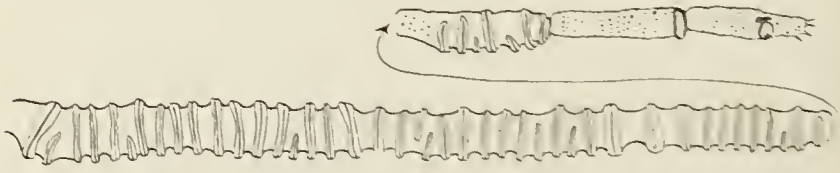


Fig. 137. The antenna of the spring migrant is strikingly different from any other elm species known to me. The annu-

lar sensoria are broad, the hollows between them deep, and they occur only on III+IV. III is nearly twice IV+V+VI in length. The terminal sensorium of V is more or less circular and fringed. In this respect it resembles the corresponding sensorium on the apterous forms of our other elm species whose winged forms have, however, lost this character, their terminal sensorium of V being apparently only a modified annulation a little broadened or otherwise irregular in shape.

BIBLIOGRAPHY.

1857. *Schizoneura ulmi,* Koch. Pflanzenlause. Fig. 337, 338.

1879. *Schizoneura ulmi,* Courchet.

1880. *Schizoneura ulmi.* Kessler. Neue Beobachtungen und Entdeckungen an den auf *Ulmus campestris* L. vorkommenden Aphiden-Arten. Taf. II, Fig. 17-21.

1881. *Schizoneura ulmi.* Buckton Monogr. of Brit. Aphides. Vol. III. Pl. CVIII and CIX. Fig. 1-4.

1881. *Schizoneura fodiens,* Buckton. Monogr. of Brit. Aphides. Vol. III. Pl. CVI. Fig. 6-12.

1896. *Schizoneura fodiens,* Cholodkovsky. Aphidologische Mitteilungen. Zoöl. Anz. N. 520, p. 508-513.

1906. *Schizoneura ulmi* (*fodiens*), Schouteden. Cat. des Aphides de Belgique.

1909. *Schizoneura ulmi* (*fodiens*), Tullgren. Aphidologische Studien I. pp. 163-169 and Figs. 78-82.

1912. *Schizoneura ulmi* (*fodiens*), Theobald. Journ. Econ. Biol. Vol. VII, No. 3, pp. 111-115. Figs. 13 B and C and 14. (Fig. 13 A is evidently not *ulmi-fodiens*).

1913. *Schizoneura ulmi* (*fodiens*). Reh, L. Handbuch der Pflanzenkrankheiten von Prof. Dr. Paul Sorauer, Dritter Band. Die tierischen Feinde. Bearbeitet von Dr. L. Reh.

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1879. *Schizoneura ulmi,* Courchet. Etude sur les galles produites par les aphidiens, Mem. de. l'acad. Montpellier, p. 99. From description of antenna, evidently not *ulmi* (*fodiens*).

1908. *Schizoneura ulmi,* Okajima. Contribution to the Study of Japanese Aphididæ. Reprint Bul. Col. Agr. Tokyo Imperial Univ. Vol. VIII, No. 1. Plate II, Fig. 2. This is not *ulmi* (*fodiens*). III is shorter than IV+V+VI. V is at least twice IV in length and annulated. This antenna has much the same proportions and characters as Theobald 1912, Fig. 13 A and may possibly be the same species.

FOOD PLANT CATALOGUE OF THE APHIDAE OF THE WORLD.

PART III.*

EDITH M. PATCH.

MYRICACEAE. SWEET GALE FAMILY.

MYRICA.

M. Gale L. Sweet Gale.

Aphis myricae Kalt. Kaltenbach, 1874, p. 622.

JUGLANDACEAE. WALNUT FAMILY.

CARYA. (Hicoria) Hickory.

C. alba (L.) Koch. Mocker Nut, White-heart Hickory.

Monellia maculella (Fitch) (?). Gillette, 1910, p. 368.

Monellia marginella (Fitch). Gillette, 1910, p. 368.

Myzocallis (?) *caryaefoliae* (Davis). Gillette, 1910, p. 369.

Phylloxera caryae Fitch. Hunter, 1901, p. 70.

Phylloxera caryacavellana Riley. Hunter, 1901, p. 70.

Phylloxera caryaefallax Walsh. Thomas, 1879, p. 164.

Phylloxera caryaefallax Riley. Williams, 1891, p. 15.

Phylloxera caryaefoliae Fitch. Hunter, 1901, p. 71.

Phylloxera caryaeglobuli Walsh (D. hemisphericum Shimer) Hunter, 1901, p. 71.

Phylloxera caryaegummosa Riley. Hunter, 1901, p. 71.

Phylloxera caryaescissa Riley. Hunter, 1901, p. 71.

Phylloxera caryaeseptа (Shimer). Hunter, 1901, p. 71.

Phylloxera (*Pemphigus*) *caryaevenae* Fitch. Hunter, 1901, p. 71.

Phylloxera (D.) *conica* Shimer. Hunter, 1901, p. 71.

Phylloxera deprcssa (Shimer). Williams, 1891, p. 15.

C. cordiformis (Wang) K. Koch (amara Nutt) (minima) Bitter Nut or Swamp Hickory.

Lachnus longistigma Monell. Sanborn, 1904, p. 31.

Monellia caryella (Fitch) Oestlund (A. punctatella Fitch) (A. maculella Fitch) (A. fumipennella Fitch) (A. marginella Fitch). Oestlund, 1887, p. 45.

Phylloxera caryaecaulis Fitch. var magna Shimer. Pergande, 1904b, p. 246.

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* Papers from the Maine Agricultural Experiment Station: Entomology No. 69. For Parts I and II see Bulletins 202 and 217.

Phylloxera caryaecaulis Fitch (D. caryaemagnum Shimer). Hunter, 1901, p. 70.

Phylloxera conica Shimer. Pergande, 1904b, p. 226.

Phylloxera (Dactylosphaera) foveata Shimer ("forcatum" and "foreatum" by misprint). Pergande, 1904b, p. 209.

Phylloxera globosa Shimer. Pergande, 1904b, p. 238.

Phylloxera globosa var. coniferum (Shimer). Pergande, 1904b, p. 238.

Phylloxera (D.) *spinosa* Shimer. Hunter, 1901, p. 72.

C. glabra Will (Hicoria glabra) Pignut or Broom Hickory.

Aphis caryae Harris. Harris, 1841, also Flint ed. 1862, p. 238.

Phylloxera caryaecaulis (Fitch). Pergande, 1904b, p. 244.

Phylloxera caryaecaulis Fitch (Dactylosphoera subellipticum Shimer) (D. caryaemagnum Shimer). Hunter, 1901, p. 70.

Phylloxera caryaefoliae Fitch. Pergande, 1904b, p. 195.

Phylloxera caryaeglobuli Walsh (D. hemisphericum Shimer). Hunter, 1901, p. 71.

Phylloxera caryae-ren Riley. Pergande, 1904b, p. 257.

Phylloxera caryaesemen Walsh (D. globosum Shimer). Hunter, 1901, p. 71.

Phylloxera caryae-semen (Walsh). Pergande, 1904b, p. 213.

Phylloxera (Dactylosphoera) caryae-septum (Shimer). Pergande, 1904b, p. 194.

Phylloxera c-septum, var. perforans Pergande. Pergande, 1904b, p. 194.

Phylloxera foveola Pergande. Pergande, 1904b, p. 200.

Phylloxera (D.) gibbosa Shimer. Hunter, 1901, p. 72.

Phylloxera pilosula Pergande. Pergande, 1904b, p. 203.

C. illinoensis K. Koch. (Hicoria olivaeformis). Pecan.

Callipterus caryae Monell. Monell, 1879, p. 31.

Phylloxera devastatrix Pergande. Pergande, 1904b, p. 248.

Phylloxera notabilis Pergande. Pergande, 1904b, p. 235.

Phylloxera sp. Hunter, 1901, p. 75.

C. ovata (Mill) K. Koch. (Hicoria alba Nutt). Shell-bark or Shag-bark Hickory.

Phylloxera caryae-fallax Riley. Pergande, 1904b, p. 214.

Phylloxera caryae-globuli Walsh (hemisphericum Shimer). Pergande, 1904b, p. 223.

Phylloxera caryae-gummosa Riley. Pergande, 1904b, p. 239.

Phylloxera caryae-scissa Riley. Pergande, 1904b, p. 220.

Phylloxera (Dactylosphoera) caryae-septum (Shimer). Pergande, 1904b, p. 194.

Phylloxera depressa (Shimer). Pergande, 1904b, p. 208.

Phylloxera intermedia Pergande. Pergande, 1904b, p. 199.

C. porcina Nutt.

Lachnus caryae (Harris). Hunter, 1901, p. 85.

C. tomentosa Nutt. (Hicoria tomentosa).

Phylloxera caryae-avellana Riley. Pergande, 1904b, p. 228.

Phylloxera caryae-caulis Fitch var. spinosa Shimer. Pergande, 1904b, p. 244.
Phylloxera caryae-scissa Riley. Pergande, 1904b, p. 220.
Phylloxera (Pemphigus?) caryaevenae Fitch. Pergande, 1904b, p. 240.
Phylloxera deplanata Pergande. Pergande, 1904b, p. 205.
Phylloxera perniciosa Pergande. Pergande, 1904b, p. 251.
Phylloxera picta Pergande. Pergande, 1904b, p. 198
Phylloxera rimosalis Pergande. Pergande, 1904b, p. 217.
Phylloxera symmetrica Pergande. Pergande, 1904b, p. 230.
Phylloxera symmetrica var. purpurea Pergande. Pergande, 1904b, p. 233.
Phylloxera symmetrica var. vasculosa Pergande. Pergande, 1904b, p. 233.

C. sp.

Callipterus caryae Monell. Monell, 1879, p. 31.
Callipterus caryaefoliae Davis. Davis, 1910a, p. 198.
Longistigma (Lachnus) caryae (Harris) Wilson. Wilson, 1909c, p. 385.
Phylloxera caryae-globosa Shimer. Thomas, 1879, p. 163.
Phylloxera (D.) *depressa* Shimer (D. coniferum Shimer). Hunter, 1901, p. 72.
Phylloxera georgiana Pergande. Pergande, 1904b, p. 249.
Phylloxera minimum (Shimer). Pergande, 1904b, p. 210.
Phylloxera spinuloides Pergande. Pergande, 1904b, p. 248.
Phylloxera subelliptica (Shimer). Pergande, 1904b, p. 250.
Schizoneura caryae (Fitch). Thomas, 1879, p. 141.

JUGLANS. Walnut.

T. californica Wats.

Monellia californica Essig. Essig, 1912, Aphid. So. Cal. X, p. 770.

J. nigra L. Black Walnut.

Lachnus longistigma Monell. Sanborn, 1904, p. 31.
Monellia caryae (Monell). Gillette, 1910, p. 367.
Monellia maculella (Fitch) (?). Gillette, 1910, p. 368.
Schizoneura caryae (Fitch). Williams, 1891, p. 26.

J. regia L. English Walnut.

Callipterus caryae Monell. Davidson, 1909, p. 301. "on English Walnut."
Callipterus juglandicola Koch. Essig, 1909, p. 52.
Callipterus juglandis (Frisch). Ferrari, 1872, p. 81.
Chromaphis juglandicola (Kalt.). Gillette, 1910, p. 367.
Lachnus juglandis (Frisch). Kaltenbach, 1874, p. 97.
Pterocallis juglandicola (Kalt.) (Lachrus Kalt.) (Aphis Walker) (Callipterus Koch). Buckton, 3, p. 34.
Ptychodes juglandis (Frisch) (Aphis) (Lachnus) (Callipterus) Buckton, 3, p. 41.

J. sp.

Aphis juglandina Walker. Walker, 1848a, p. 335.

BETULACEAE. BIRCH FAMILY.

ALNUS. Alder.

A. glutinosa (L.)

Aphis alni Fab. (nicht A. alni Schrank) (A. maculata Heyden). Kaltenbach, 1843, p. 138.

Callipterus giganteus Chol. Cholodkovsky, 1899, p. 474.

Pterocallis alni (Fab.), Pass. Buckton, 3, p. 32.

A. incana (L.) Willd. Speckled or Hoary Alder.

Callipterus giganteus Chol. Cholodkovsky, 1899, p. 474.

Pemphigus tessellata Fitch (acerifolii Riley). Patch, 1908, p. 484.

Vacuna alni (Schrank) Pass. (V. betulae Kalt.) (Glyphina betulae Koch). Passerini, 1863, p. 84.

A. rhombifolia Nutt.

Euceraphis flava Davidson. Davidson, 1912, p. 406.

Myzocallis alni (Fab). Essig, 1912, Aphid. So Cal. X, p. 767.

A. rubra Boug.

Lachnus alnifoliae Fitch. Williams, 1891, p. 5.

Pemphigus tessellata Fitch (Chermes alni Kalm). Hunter, 1901, p. 79.

A. sp.

Aphis alni Fab. Kaltenbach, 1874, p. 620.

Aphis alni Schrank. Kaltenbach, 1874, p. 620.

Aphis bifrons Walker. Walker, 1848a, p. 444. "On alder?"

Callipterus (Pterocallis) alni Fab. Davis, 1910b, p. 416.

Glyphina alni Schrank. Lichtenstein, La Flore.

Lachnus alnifoliae Fitch. Thomas, 1879, p. 118. Essig, 1912, Aphid. So. Cal. X, p. 773.

Pemphigus alni Provancher. Kirkaldy, 1906, p. 15.

Pterocallis maculata Heyden. Lichtenstein, La Flore.

BETULA. Birch.

B. alba L. (papyracea Ait) (pubescens Ehrh) (papyrifera Marsh). Paper, Canoe or White Birch.

Aphis antennata Kalt. Kaltenbach, 1843, p. 115.

Aphis betularia Kalt. (A. tuberculata Heyden). Kaltenbach, 1843, p. 120.

Aphis comes Walker. Walker, 1848a, p. 258.

Aphis nigritarsis Heyden. Kaltenbach, 1843, p. 135.

Aphis quadrituberculata Kalt. Kaltenbach, 1843, p. 134.

Callipterus betulicola (Kalt.?) (C. betulae Koch). Buckton, 3, p. 16.

Callipterus betulaccolens (Fitch) Monell. Davis, 1909a, p. 30.

Callipterus oblongus Heyden (Aphis oblonga Heyden) Del Guercio, 1900, p. 111.

Chaitophorus betulae Buckton (?). Gillette, 1910, p. 367.

Chaitophorus betulinus van der Goot. Van der Goot. 1912, p. 278.
Glyphina alni Schrank (betulae Kaltenbach) (betulina Buckton). Schouteden, 1906a, p. 192.
Hamamelistes spinosus Shimer (Hormaphis papyraceae Oestlund) Oestlund, 1887, p. 20.
Symdobius oblongus (Heyden). Patch, 1910b. p. 245.
Symdobius oblongus Heyden. Schouteden, 1906a, p. 210.
Vacuna betulae Kalt. Kaltenbach, 1843, p. 177.

B. alpestris Fries.

Hamamelistes betulae Mordw. Tullgren, 1909, p. 58.

B. fontinalis.

Calaphis betulaecolens (Fitch). Gillette, 1910, p. 371.
Euceraphis betulae (Koch). Gillette, 1910, p. 371.
Hamamelistes spinosus Shimer. Gillette, 1909a, p. 353.

B. nigra L. River or Red Birch.

Calaphis betulella Walsh. Walsh, 1862, p. 302.
Hormaphis (Brysocrypta) hamamelidis Fitch (Hamamelistes cornu Shimer). Pergande, 1901, p. 8.

B. tremula.

Callipterus carpini Koch. (A. coryli Kalt?). Buckton, 3, p. 19.

B. sp.

Aphis antennata Kalt. Kaltenbach, 1874, p. 610.
Aphis betulae Linn. Kaltenbach, 1874, p. 609. Tullgren, 1909, p. 4.
Aphis (Callipterus) betulae Koch. Kaltenbach, 1874, p. 610.
Aphis betulicola Kalt. Kaltenbach, 1874, p. 609.
Aphis betulina Walker. Walker, 1852, p. 1039. Host plant not given.
Aphis callipterus Hartig. Hartig, 1841, p. 369.
Aphis comes Walker. Kaltenbach, 1874, p. 610.
Aphis impingens Walker. Kaltenbach, 1874, p. 610.
Aphis inhaerens Walker. Walker, 1852, p. 1041.
Aphis nigritarsis Heyden. Kaltenbach, 1874, p. 609.
Aphis quadrituberculata Kalt. Kaltenbach, 1874, p. 609.
Bradyaphis antennata ———. Mordwilko 1899, p. 407.
Callipteroides betulae (nigritarsis). Mordwilko, 1899, p. 407.
Callipterus betularius Kalt. (A. tuberculata Heyden?) (A. antennata Kalt?) (betulae Walker). Buckton, 3, p. 14.
Callipterus tuberculata Heyden. Lichtenstein, La Flore.
Chaitophorus annulatus Koch. Koch, p. 8.
Chaitophorus betulae Buckton. Buckton, 2, p. 140.
Chaitophorus tricolor Koch. Koch, p. 10 (A. betularia?).
?*Eriosoma imbricator* Fitch. "An insect closely allied to E. imbricator abundant on birch in Maryland in October." Glover, 1877, p. 39.
Eriosoma tessellata Fitch. Glover, 1877, p. 39.
Glyphina betulae Kalt. Tullgren, 1909, p. 48.
Glyphina betulae Heyden (Vacuna alni Pass.?) (Tremulinax Amyot). Buckton, 4, p. 18.

Hamamelistes betulae Mordwilko. (Mss. correction of Cerataphis betulae Mordwilko). Mordwilko, 1899, p. 973.
Hamamelistes (Tetraphis) betulina Horvath. Kirkaldy, 1906, p. 17.
Hamamelistes spinosus Shimer (Hormaphis papyraceae Oestlund). Pergande, 1901, p. 25.
Symdobius oblongus (Heyden). Mordwilko, 1899, p. 409.
Symdobius oblongus Heyden. Schouteden, 1906a, p. 210.
Vacuna betulae Kalt. Kaltenbach, 1874, p. 610.

CARPINUS. Hornbeam.

C. Betulus L.

Callipterus carpini Koch. (A. coryli Kalt?). Buckton, 3, p. 19.
Callipterus coryli (Goetze) Koch. Buckton, 3, p. 18.
Myzocallis coryli (Goetze) Pass. (A. avellanae Schrank) (C. coryli Koch) (C. carpini Koch). Passerini, 1863, p. 55.

CORYLUS. Hazelnut.

C. Avellana L.

Callipterus carpini Koch (A. coryli Kalt.). Koch, p. 216.
Callipterus coryli (Goetze) Koch. (Myzocallis coryli Pass.) Buckton, 3, p. 18.
Myzocallis coryli (Goetze) (Callipterus carpini Koch). Ferrari, 1872, p. 75.
Myzocallis coryli (Goetze) Pass. (A. avellanae Schrank) (C. coryli Koch) (C. carpini Koch). Passerini, 1863, p. 55.
Myzus tetrarhoda Walker (Aphis) (Siphonophora rosarum Koch) Ferrari, 1872, p. 61.
Siphonophora avellanae (Schr.) Koch (coryli Mosley) Buckton, 1, p. 150.
Siphonophora avellanae Koch. (A. avellanae Walker). Passerini, 1863, p. 12.

C. sp.

Callipterus (Myzocallis) coryli Goetze. Davis, 1910b, p. 417.

OSTRYA. Hop Hornbeam.

O. virginiana Mill. American Hop Hornbeam, Leverwood.

Siphonophora sp. ("apparently identical with S. geranii Oestlund"). Osborn and Sirrine, 1893, p. 236.

FAGACEAE. BEECH FAMILY.

CASTANEA. Chestnut.

C. dentata Marsh. Chestnut.

Calaphis castaneae (Fitch). Gillette, 1910, p. 368.
Callipterus castaneae Fitch. Thomas, 1879, p. 114.

C. pumila Mill. Chinquapin.

Callipterus quercus Kalt. Buckton, 3, p. 22.

C. sativa Mill. (Castanea vesca).

Aphis castanea-vesca Haldeman. Hunter, 1901, p. 95.

Callipterus castaneae Buckton. Buckton, 3, p. 26.

Dryaphis longipes (Dufour) (*Pterochlorus* Passerini) (*Lachnus* Buckton) (*Dryobius croaticus* Koch) Del Guercio, 1907 (1908) Redia V, pp. 277, 345.

Phylloxera (*Chermes*) *castaneae* Haldeman. Pergande, 1904b, p. 258.

Phylloxera sp. Hunter, 1901, p. 74.

FAGUS. Beech.

F. grandifolia Ehrh. (ferruginea) (Americana).

Pemphigus imbricator (Fitch). Weed, 1893, p. 302.

Pemphigus imbricator (Fitch). Jackson, 1908, p. 189.

Phyllaphis fagi Linn. Gillette, 1909a, p. 385.

Phyllaphis fagi (Linn.)?. Weed, 1893, p. 302.

F. sylvatica L. (sylvestris).

Pemphigus fagi Koch. Passerini, Flora.

Phyllaphis fagi Linn. (Lachnus fagi Burmeister). Buckton, 3, p. 38.

Phyllaphis fagi Linn. Gillette, 1909a, p. 385.

Pterochlorus roboris Linn. (? fasciatus Burmeister) (exsicator Altum). Schouteden, 1906a, p. 208.

F. sp.

Aphis pallipes Hartig. Hartig, 1841, p. 369.

Chermes fagi Kalt. Hartig, R., 1880, p. 156, and Kaltenbach, 1874, p. 631.

Lachnus exsicator Altum. Hartig, R., 1880, p. 151.

Lachnus fagi Linn. Kaltenbach, 1874, p. 631.

QUERCUS. (Pasania) Oak.

Q. acuta Thunb.

Trichosiphum kuscanca Pergande. Okajima, 1908, p. 2.

Trichosiphum pasaniae Okajima. Okajima, 1908, p. 5.

Q. Aegilops L.

Lachnus dryophila (Schrank) Kalt. Passerini, 1863, p. 83.

Q. agrifolia Nee.

Schizoneura querci Fitch. Davidson, 1910, p. 374.

Q. alba L. White Oak.

Lachnus quercifoliae Fitch. Hunter, 1901, p. 85.

Myzocallis (?) sp. Gillette, 1910, p. 360.

Phylloxera quercetí Perg. Pergande, 1904b, p. 265.

Phylloxera rileyi Riley (Licht. mss). Pergande, 1904b, p. 263.

Q. bicolor Willd. Swamp White Oak.

Callipterus discolor Monell (Myzocailis bella Thomas) (Myzocallis quercicola Thomas mss.) (C. asclepiadis Monell?). Hunter, 1901, p. 90.

Callipterus discolor Monell. Monell, 1879, p. 30.

Callipterus punctata Monell. Monell, 1879, p. 30.

Phylloxera rileyi Licht. Hunter, 1901, p. 72.

Q. cerris Linn.

Phylloxera spinulosa Targioni-Tozzetti. Zoölogical Record, 1875, p. 512.

Psylloptera quercina Ferrari. Ferrari, 1872, p. 86.

Pterochlorus longipes Leon Dufour (Aphis) (roboris Boyer) (Dryobius croaticus Koch). Ferrari, 1872, p. 82.

Dryaphis cerricola Del Guercio. Del Guercio, 1907 (1908) Redia V, p. 345.

Dryaphis roboris nigra Del Guercio. Del Guercio, 1907 (1908) Redia V, p. 345.

Q. coccifera L.

Phylloxera quercus Boyer, Buckton, 4, p. 50.

Q. coccinea Wang. Scarlet Oak.

Callipterus bellus (Walsh) (C. walshii Monell). Hunter, 1901, p. 89.

Q. cuspidata Thunb. (Pasania cuspidata Oerst.)

Trichosiphum pasaniae Okajima. Okajima, 1908, p. 5.

Trichosiphum tenuicorpus Okajima. Okajima, 1908, p. 4.

Q. dentata Thunb. (daimio.)

Phylloxera querceti Pergande. Pergande, 1904b, p. 265.

Q. Douglasii Hook and Arn.

Callipterus quercus Kalt (?). Davidson, 1910, p. 376.

Q. Farnetto Tenore (pannonica).

Phylloxera querceti Perg. Pergande, 1904b, p. 265.

Q. Ilex L. Evergreen Oak.

Aphis rumicis Linn. (fabae Kirby) (genistae Scop.) (ulicis Fab?) (Euphorbiae Kalt?) (dahliae Mosley) (Cinara rumicis Mosley) (Rumicifex Amyot) (Genistifex Amyot). Buckton, 2, p. 84.

Callipterus quercus (Kalt.) Koch. (Myzocallis quercus Pass.) Buckton, 3, p. 22.

Dryaphis ilicina Del Guercio. (*Aphis ilicicola* Boisduval) Del Guercio, 1907 (1908), Redia V, p. 345.

Dryaphis iliciphila Del Guercio. (*Aphis ilicicola* Boisduval) Del Cuercio 1907 (1908) Redia V, p. 345.

Dryobius croaticus Koch (A. roboris Walker *not* Linn). Buckton, 3, p. 76.

Phylloxera coccinea Kalt. Passerini, Flora.

Phylloxera florentina Targioni. Buckton, 4, p. 71.

Phylloxera quercus Boyer. Fusclimi, 1906 (1907) Redia IV, p. 361.

Vacuna dryophila (Schrank) Kalt. Passerini, 1863, p. 83.

Q. imbricaria Michx. Laurel or Shingle Oak.

Callipterus hyalinus Monell. Monell, 1879, p. 30.

Q. Kelloggii Newberry. (Quercus californica.)

Callipterus quercus Kalt. (?). Davidson, 1910. p. 376. Davidson, 1909, p. 302.

Q. lamellosa Sm. (imbricata).

Callipterus hyalinus Monell. Clarke, 1903, p. 249.

Q. lobata Nee.

Callipterus quercus (?) Kalt. Davidson, 1909, p. 302.

Q. macrocarpa Mx. Bur Oak, Overcup or Mossy-cup Oak.

Callipterus bella (Walsh). Williams, 1891, p. 19.

Callipterus discolor Monell. Weed, 1888, p. 131.

Callipterus discolor Monell (Myzocallis bella Thos.). Oestlund, 1887, p. 41.

Callipterus punctata Monell. Williams, 1891, p. 7.

Chaitophorus spinosus Oestlund. Williams, 1891, p. 7.

Phylloxera quercoti Perg. Pergande, 1904b, p. 265.

Schizoneura querci (Fitch). Williams, 1891, p. 7.

Q. marilandica Muench. (marylandica). Black Jack or Barren Oak.

Lachnus longistigma Monell. Sanborn, 1904, p. 31.

Q. obtusiloba Michx.

Phylloxera rileyi Riley. Pergande, 1904b, p. 263.

Q. phellos L. Willow Oak.

Phyllaphis niger Ashmead. Hunter, 1901, p. 84.

Q. prinus L. Chestnut Oak.

Callipterus? quercicola Monell. Monell, 1879, p. 31.

Chaitophorus quercicola Monell. Monell, 1879, p. 32.

Q. pubescens.

Phylloxera coccinea Heyden. Lichtenstein, 1876, p. 11.

Phylloxera quercus Boyer. Buckton, 4, p. 50.

Q. Robur L. (pedunculata Ehrh) (fastigiata DC.) (sessiliflora).

Abamalekia lazarevi Del Guercio. Del Guercio, 1905 (1906) Redia III, p. 360.

Callipterus querceus (Kalt.) Koch. Buckton, 3, pp. 22, 26.

Dryaphis minor Del Guercio. Del Guercio, 1907 (1908) Redia V, p. 345.

Dryobius roboris (Linn.) Koch (Lachnus fasciatus Burm?) (Cinara roboris Curtis) (Lachnus roboris Kalt.) (Dryaphis Amyot). Buckton, 3, p. 73. Del Guercio, 1907 (1908) Redia V, p. 273

Lachnus longipes (Dufour) (A. roboris Boyer *not* Linn) (Pterochlorus longipes Rondani). Buckton, 3, p. 61.

Lachnus quercus (L.) Kalt. (A. fusca Geoffrey) (Phylloxera longirostris Boyer). Passerini, 1863, p. 65.

Lachnus roboris Linn. Kaltenbach, 1874, p. 677.

Myzocallis insignis Ferrari. Macchiati, 1883, p. 260.

Myzocallis quercus (Kalt.) Pass. Passerini, 1863, p. 54.

Phylloxera acantho-chermes Kollar (sub. Acantho-chermes quercus). Buckton, 4, p. 68.

Phylloxera coccinea Kalt. (Vacuna coccinea Heyden) (Ph. quercus Boyer). Passerini, 1863, p. 84.

Phylloxera coccinea Heyden. Buckton, 4, p. 68.

Phylloxera coccinea Heyd. (quercus Boyer). Kaltenbach, 1874, p. 677.

Phylloxera coccinea Heyden (quercus Balbiani nec Boyer). Schouteden, 1906a, p. 191.

Phylloxera corticalis Kalt. Buckton, 4, p. 68, and Kaltenbach, 1874, p. 677.

Phylloxera punctata Lichtenstein. Buckton, 4, pp. 68, 45.

Phylloxera punctata Licht. Lichtenstein, 1876, p. 12.

Phylloxera quercus Boyer (coccinea Passerini nec Heyden) (Balbianii Lichtenstein) (florentina Targioni-Tozzetti) (Lichtensteini Balbiani) (signoreti Targioni-Tozzetti). Schouteden, 1906a, p. 191.

Pterochlorus longipes (Dufour) Pass. (A. roboris Boyer) (Pt. roboris Rond.) (Dryobius croaticus- Koch). Passerini, 1863, p. 67.

Pterochlorus longipes Dufour (nec Buckton!). (roboris Boyer) (croaticus Koch-Buckton) (? riparius Snellen van Vollenhoven). Schouteden, 1906a, p. 208.

Pterchlorus roboris Linne. (? fasciatus Burmeister) (exsiccator Altum). Schouteden, 1906a, p. 208.

Schizoneura lusitanica Horvath. Horvath, 1908, p. 132.

Stomaphis quercus (Linn) Del Guercio, 1907 (1908) Redia V, p. 344.

Thelaxes dryophila (Heyden) Westwood (Aphis dryophila Ratz). (Vacuda Amyot) (Cinara quercus O. Mosley) Buckton, 4, p. 10.

Vacuna dryophila Schrank (quercus Mosley) (quercicola Westwood) Schouteden, 1906a, p. 192.

Vacuna dryophila Schrank (Aphis). Ferrari, 1872, p. 85.

Q. rubra L. Red Oak.

Callipterus bellus (Walsh). Oestlund, 1887, p. 44.

Callipterus quercifolii Thomas. Thomas, 1879, p. 113.

Myzocallis bella (Walsh). Gillette, 1910, p. 368.

Myzocallis walshii (Monell). Gillette, 1910, p. 368.

Q. serrata Thunb.

Trichosiphum kuwanae Pergande. Pergande, 1906, p. 209.

Trichosiphum pasaniae Okajima. Okajima, 1908, p. 2.

Q. sessilifolia Blume.

Lachnus quercus (L.) Kalt. (A. fusca Geoffrey) (Phylloxera longirostris Boyer). Passerini, 1863, p. 65.

Phylloxera florentina Targ.-Toz. Lichtenstein, 1876, p. 12.

Q. suber.

Dryaphis minor Del Guercio. Del Guercio, 1907 (1908) Redia V, p. 345.

Tavarcsiella suberi Del Guercio. Del Guercio, 1909 (1910) Redia VII, p. 297.

Q. virginiana Mill. (virens). Live Oak.

Lachnus quercicolens Ashmead. Hunter, 1901, p. 85.

Q. undulata Torr.

Schizoneura querci (Fitch). Hunter, 1901, p. 84.

Q. sp.

Acanthochermes quercus (Kollar) CB. Börner, 1909b, p. 60.
Aphis annulatus Hartig. Hartig, 1841, p. 369.
Aphis hirticornis Walker. Walker, 1848a, p. 447.
Aphis quercifoliae Walsh. Walsh, 1862, p. 298.
Aphis quercus-monticula Haldeman. Haldeman, 1844, p. 168.
Aphis suberis Tavares. Schouteden, 1906c.
Callipterus ? quercicola Monell. Monell, 1879, p. 31.
Chaitophorus quercicola Monell (Callipterus quercifolii Thomas) (Chait. spinosus Oestlund). Davis, 1910b, p. 415.
Chaitophorus spinosus Oestlund. Oestlund, 1887, p. 38.
Drepanosiphum? (*Aphis*) *quercifoliae* (Walsh). Thomas. Thomas, 1879, p. 79.
Dryobius longirostris Mordwilko. Mordwilko, 1909, p. 85.
Lachnus allegheniensis McCook. McCook, 1877, p. 274.
Lachnus (*Dryobius*) *croaticus* Koch. Kaltenbach, 1874, p. 677.
Lachnus fuscus Geoffrey. Lichtenstein, La Flore.
Lachnus longirostris Fab. Lichtenstein, La Flore.
Lachnus (*Callipterus?*) *quercifoliae* Fitch. Thomas, 1879, p. 118.
Longistigma (*Lachnus*) *caryae* (Harris). Wilson, 1909a, p. 385.
Moritziella (*Phylloxera*) *corticalis* (Kalt.) C. B. Börner, 1909b, p. 61.
Myzocallis bella (Walsh). Thomas, 1879, p. 106.
Myzocallis quercea (Kalt.) Pass. Passerini, 1863, p. 55.
Myzocallis quercus Kalt. (Aphis). Ferrari, 1872, p. 75.
Pemphigus pedunculi Hartig. Hartig, 1841, p. 367.
Phylloxera bipunctatum Licht. Lichtenstein, 1874, p. CCI.
Phylloxera coccinea Heyden. Börner, 1909b, p. 62.
Phylloxera-Foaiella (Börneria Grassi et Foa: nec. Willem, nec Axelson) danesii Grassi et Foa. Börner, 1909b, p. 61.
Phylloxera foae CB. Börner, 1909b, p. 62.
Phylloxera glabra Heyden. Börner, 1909b, p. 62.
Phylloxera scutifera Signoret. Lichtenstein, La Flore.
Phylloxera spinulosa Targioni. Lichtenstein, La Flore.
Phylloxera-Acanthephis Del Guercio (Hystrichiella CB). spinulosa Tg.-Tz. Börner, 1909b, p. 62.
Schizoneura querci Fitch. Davis, 1910b, p. 413.
Schizoneura querci Fitch. Thomas, 1879, p. 139.
Stomaphis quercus Reaum. (Puceron de Chene Reaum) (A. quercus Linn) (longirostris Fab?) (Lachnus quercus Kalt.) Buckton, 3, p. 64.

Stomaphis macrorhyncha Chol. Cholodkovsky, 1894 (1895), p. 405. "auf eichenrinde."

Vacuna dryophila Schrank. Tullgren, 1909, p. 41.

URTICACEAE. NETTLE FAMILY.

ARTOCARPUS.

A. integrifolia L.

Greenidea (Siphonophora) artocarpi Westwood. Schouteden, 1905, p. 183.

CANNABIS. Hemp.

C. sativa L.

Aphis sativae Williams. Williams, 1910, p. 57.

Phorodon cannabis Pass. Ferrari, 1872, p. 60.

HUMULUS. Hop.

H. hepulus L. (neomexicanus).

Aphis gossypii Glover (citrifolii Ashmead, in part) (citrulli Ashmead) (cucumeris Forbes) (forbesi Weed?). Pergande, 1895, p. 314.

Aphis humuli Schrank. Kaltenbach, 1874, p. 534.

Myzus phenax Cockerell. Cockerell, 1903b, p. 115.

Phorodon humuli (Schrank) Pass. Passerini, 1863, p. 18.

Phorodon humuli (Schrank) Pass. (A. pruni Scop) (A. humulifex Anyot). Buckton, 1, p. 167.

MORUS. Mulberry.

M. sp.

Aphis mori Clarke. Clarke, 1903, p. 251.

PARIETARIA. Pellitory.

P. effusa.

Aphis urticaria Kalt. Kaltenbach, 1874, p. 69.

P. officinalis L.

Aphis scabiosae Kalt. (A. chloris Koch?). Buckton, 2, p. 55.

Aphis urticae Fab. (urticaria Kalt.) Macchiati, 1883, p. 258.

P. sp.

Aphis parietariae Licht. (ined). Lichtenstein, La Flore.

PLANERA. Planer Tree.

P. sp.

Schizoneura lanuginosa Hart. Lichtenstein, Flore Supplement.

ULMUS. Elm.

U. americana L. American or White Elm.

Callipterus ulmifolii Williams. Williams 1891, p. 26, 1910, p. 2, "previously described by Monell."

Callipterus ulmifolii Monell (ulmicola Thos.). Oestlund, 1887, p. 42.

Callipterus sp. Sanborn. Sanborn, 1904, p. 42.

Callipterus n. sp. Sanborn. Sanborn, 1904, p. 41.

Colopha ulmicola (Fitch) Monell. Patch. 1910a. p. 197.

Pemphigus walshii Williams. Williams, 1910 (1911), p. 16.

Schizoneura americana Riley. Patch. 1913, Bul. 217 and Bul. 220.

Schizoneura lanigera (*americana* in part). Patch. 1913. Bul. 217, p. 173, Bul. 220, p. 264.

Schizoneura rileyi Licht. Williams, 1891, p. 26.

Schizoneura rileyi Thomas (Eriosoma ulmi Riley). Patch. 1910a, p. 235. 1913. Bul. 217, p. 184 and Bul. 220, p. 260.

Tetraneura graminis (colophoidea Monell) Monell. Patch. 1910a. p. 208.

U. campestris L. (suberosa) English Elm.

Callipterus elegans Koch (Lachnus platani Kalt.) Koch, p. 213.

Schizoneura lanuginosa Hartig. (A. ulmi Boyer) (Mimaphidus ulmi Rondani). Passerini, 1863 p. 70. Patch. 1913, Bul. 217, p. 184, Bul. 220, p. 263.

Schizoneura ulmi (Linn.) (fodiens Buckton). Tullgren, 1909, p. 169. Patch, 1913, Bul. 217, p. 184, Bul. p. 271.

Tetraneura (*Byrsocrypta*) *pallida* (Hal.) Del Guercio (A. alba Ratz) (T. alba Kessler) (P. pallidus Buckton). Tullgren, 1909. p. 185.

Tetraneura ulmi DeGeer (coerulescens Mordwilko nec Passerini) Schouteden, 1906a, p. 200.

Tetraneura ulmi Geoffr. (? Pemphigus coerulescens Pass.) Tullgren, 1909, p. 180.

U. fulva Michx (pubescens Walt.) Slippery or Red Elm.

Pemphigus ulmifusus Walsh. Patch, 1910a, p. 220.

U. montana With. Scabra Mill. (Camperdown pendula). Scotch or Wych Elm.

Schizoneura ulmi Linn. Connold, 1902, p. 245. Patch, 1913, Bul. 217, p. 184, Bul. 220, p. 271.

Tetraneura ulmi (Linn.). Patch, 1910a, p. 219.

Tetraneura ulmisacculi Patch. Patch, 1910a, p. 216.

U. racemosa Thomas. Cork or Rock Elm.

Colopha ulmicola (Fitch) Monell (eragrostidis Middleton). Patch, 1910a, p. 204.

U. sp.

Georgia ulmi Wilson. Wilson, 1911, p. 65.

Lachnus platani Kalt. Kaltenbach, 1874, p. 540.

Lachnus ulmi (Linn.) Thomas, 1879, p. 119 "error for Schizoneura ulmi (Linn.)."
Myzocallis ulmifolii (Monell). Gillette, 1910, p. 369.
Pemphigus pallidus (Haliday) (P. albus Licht.) (ulmi Licht?) Buckton, 3, p. 127.
Pemphigus ulmi Licht. Lichtenstein, 1880, pp. 1-5.
Schizoneura compressa Koch. Lichtenstein, La Flore.
Tetraneura alba Ratz? (Schizoneura compressus Koch) Kaltenbach, 1874, p. 540.
Tetrancura rubra Licht. Lichtenstein, La Flore.

URTICA. Nettle.

U. dioica Pursh. Stinging Nettle.
Aphis tertia Walker. Walker, 1849c, p. 45.
Aphis urticae Fab. (urticaria Kalt.). Ferrari, 1872, p. 65.
Aphis urticaria Kalt. Buckton, 2, p. 51.
Siphonophora pisi (Kalt.) Koch (A. ulmariae Schrank) (onobrychis Boyer) (lathyri Walker). Buckton, 1, p. 135.
Siphonophora urticae (Kalt, Schrank) Koch. Buckton, 1, p. 144.
U. gracilis Ait.
Siphonophora pisi Kalt. Williams, 1891, p. 18.
U. holosericea Nutt.
Macrosiphum pisi Kalt. Davidson, 1909, p. 304.
U. urens L.
Aphis rumicis Linn. Walker, 1850a, p. 19.
Aphis urticae Fab. (urticaria Kalt.). Macchiati, 1883, p. 258.
Aphis urticaria Kalt. Buckton, 2, p. 51.
Siphonophora carnosa Buckton. Buckton, 1, p. 145.
Siphonophora urticae (Kalt., Schrank) Koch. Buckton, 1, p. 145.
U. sp.
Aphis lamii Koch. Koch, p. 85.

POLYGONACEAE. BUCKWHEAT FAMILY.

ERIOGONUM.

E. alatum Torr.
Aphis eriogoni Cowen. Cowen, 1895, p. 119.
E. umbellatum Torr.
Aphis eriogoni Cowen. Cowen, 1895, p. 119.
E. sp.
Nectarophora martini Cockerell. Cockerell, 1903a, p. 171.

POLYGONUM. (Persicaria) Knotweed.

P. aviculare L.
Aphis ? polygoni Macchiati var. Schouteden, 1906a, p. 226.
Aphis polygoni Walker. Walker, 1848c, p. 2249.

Pemphigus betae Doane. Jackson, 1908, p. 218.
Phorodon galeopsidis Kaltenbach. Theobald, 1911-12.
Schizoneura corni (Fab.) (S. venusta Pass.) (E. fungicola Walsh) (E. cornicola Walsh) (S. panicola Thomas). Hunter, 1901, p. 81.
Sipha polygoni Schouteden. Schouteden, 1907, p. 265.

P. Hydropiper L. Common Smartweed or Water Pepper.
Phorodon galeopsidis Kalt. (Aphis). Ferrari, 1872, p. 60.

P. hydropiperoides Michx. Mild Water Pepper.
Aphis maidiradicis Forbes. Vickery, 1910, p. 103.

P. incarnatum Ell.
Aphis maidi-radicis Forbes. Davis, 1909b, p. 124.

P. lapathifolium L.
Aphis galeopsidis Kalt. Kaltenbach, 1874, p. 484.

P. laxiflorum.
Aphis galeopsidis Kalt. Kaltenbach, 1874, p. 484.

P. mite Schrank (dubium).
Phorodon galeopsidis (Kalt.) Pass. (Walker ex parte). Passerini, 1863, p. 19.

P. Muhlenbergii S. Wats.
Aphis maidiradicis Forbes. Vickery, 1910, p. 103.

P. pennsylvanicum L.
Aphis sp. Williams, 1891, p. 16.
Schizoneura corni (Fab.) Williams, 1910, p. 19.

P. persicaria L. Lady's Thumb.
Aphis dianthi Schrank. Walker, 1850a, p. 394.
Aphis maidi-radicis Forbes. Davis, 1909b, p. 124.
Aphis maidi-radicis Forbes. Vickery, 1910, p. 104.
Aphis maidis Fitch. Williams, 1891, p. 16.
Aphis rumicis Linn. (fabae Kirby) (genistae Scop.) (ulicis Fab?) (euphorbiae Kalt.?) (dahliae Mosley) (Cinara rumicis Mosley) (Rumicifex Amyot) (Genistifex Amyot). Buckton, 2, p. 84.
Aphis transiens Walker. Walker, 1849c, p. 44.
Phorodon galeopsidis (Kalt.) Pass. Buckton, 1, p. 173.
Schizoneura corni (Fab.) Williams, 1910, p. 19.
Siphonophora cerealis Koch (Aphis cerealis Kalt.) (A. avenae Walker *non* Schrank). Passerini, 1863, p. 11.
Siphonophora dirhodi Walker. Buckton, 1, p. 133.
Siphonophora granaria Kirby (avenae Fab?) (hordei Kyber) (cerealis Kalt.) (Bromaphis Amyot) Buckton, 1, p. 116.
Siphonophora polygoni Buckton. Buckton, 1, p. 123.
Siphonophora polygoni (Walker). Thomas, 1879, p. 62.

P. sp.
Amycla albicornis Koch. Koch, p. 305.
Aphis polygoni Licht. Lichtenstein, Flore Supplement.
Schizoneura panicola Thos. Hart, 1891 and 1892, p. 87.

RHEUM.

R. Rhaponticum L. Rhubarb.

Aphis rumicis Linn. (fabae Kirby) (genistae Scop.) (ulicis Fab?) (euphorbiae Kalt?) (dahliae Mosley) (Cinara rumicis Mosley) (Rumicifex Amyot) (Genistifex Amyot). Buckton, 2, p. 82.

Aphis rhei Koch? Theobald, 1911-12.

R. sp.

Aphis rhei Koch. Koch, p. 127.

RUMEX. Dock.

R. acetosa L. Garden Sorrel.

Aphis acetosae Buckton. (molluginis Koch?). Buckton, 2, p. 81.

Aphis rumicis Linn. Thomas, 1879, p. 88.

R. acutifolius.

Aphis rumicis Linn. Walker, 1850a, p. 18.

R. altissimus Wood. Pale Dock.

Aphis atriplicis Linn. Williams, 1891, p. 10.

Aphis maidi-radicis Forbes. Davis, 1909b, p. 124.

Aphis rumicis Linn. Williams, 1891, p. 10.

R. conglomeratus Murr.

Aphis acetosae Fab. Kaltenbach, 1874, p. 519.

Aphis rumicis Linn. Walker, 1850a, p. 18.

R. crispus L. Yellow Dock.

Aphis gossypii Glover (citrifolii Ashm. In part) (citrulli Ashm.) (cucumeris Forbes) (forbesi Weed?). Pergande, 1895, p. 313.

Aphis maidi-radicis Forbes. Davis, 1909b, p. 124.

Aphis rumicis Linn. Sanborn, 1904, p. 47.

Aphis rumicis Linn. (fabae Kirby) (genistae Scop.) (ulicis Fab?) (euphorbiae Kalt?) (dahliae Mosley) (Rumicifex Amyot) (Genistifex Amyot). Buckton, 2, p. 83.

Nectarophora tabaci Pergande. Pergande, 1898, p. 300.

R. obtusifolius L.

Aphis rumicis Linn. Walker, 1850a, p. 18.

R. occidentalis S. Wats.

Pemphigus betae Doane. Davidson, 1909, p. 299.

R. pulcher L.

Aphis rumicis Linn. Macchiati, 1883, p. 257.

R. venosus Pursh.

Aphis rumicis Linn. Williams, 1891, p. 10.

R. sp.

Aphis carbocolor Gillette. Gillette, 1907a, p. 391.

Aphis malvae Walker. Buckton, 2, p. 43.

Aphis ochropus Koch. Theobald, 1913, Journ. Bd. Agr. Vol. 19. Feb.

Aphis relata Walker. Walker, 1849c, p. 44.

Aphis rumicis? L. (euonymi Fab.). Hayhurst, 1909b, p. 98.

Myzus persicae Sulzer. Gillette and Taylor, 1908, p. 36.

CHENOPODIACEAE. GOOSEFOOT FAMILY.

ATRIPLEX. Orach.

A. babingtoni.

Aphis atriplicis Linn. Theobald, 1913. Journ. Bd. Agr. 19. Feb.

A. canescens James (Obione tetraptera).

Aphis tetrapteralis Cockerell. Cockerell, 1902.

A. hastata L. (latifolia.)

Aphis atriplicis Linn. (A. chenopodii Schrank) (A. atriplicis Pass.?). Buckton, 2, p. 88.

Aphis papaveris Fb. Kaltenbach, 1874, p. 269.

Aphis rumicis Linn. Walker, 1850a, p. 19.

A. hortensis L.

Aphis rumicis Linn. (cracae Linn.) (fabae Scop.) (genistae Scop.) (acetosae Linn.) (euonymi Fab.) (papaveris Fab.) (hortensis Fab.) (viciae Fab.) (chenopodii Schrank) (thlaspeos Schrank) (armata Hausm.) (laburni Kalt.) (dahliae Mosley) (viburni Scop.). Hunter, 1901, 1. 104.

A. littoralis.

Aphis atriplicis Linn. Theobald, 1913. Journ. Bd. Agr. 19. Feb.

A. patula L. (angustifolia)

Aphis atomaria Walker. Walker, 1849c, p. 50.

Aphis atriplicis L. (Chenopodii Schrank). Passerini, 1863. p. 47.

Aphis atriplicis L. (Uraphis-Hayhurstia atriplicis Del G.) Hayhurst, 1909b, p. 88.

Aphis chenopodii Schrank (A. atriplicis Linn ist nicht A. atriplicis Fab.). Kaltenbach, 1843, p. 107.

Aphis papaveris Fab. Kaltenbach, 1874, p. 508.

A. portulacoides L.

Aphis atriplicis Linn. (not Buckton). Theobald, 1911-12.

BETA.

B. vulgaris L. (maritima) Cultivated Beet.

Aphis atriplicis L. (Uraphis-Hayhurstia atriplicis Del G.) Hayhurst, 1909b, p. 88. Theobald, 1911-12.

Aphis brevisiphona Theobald. Theobald, 1913. Journ. Bd. Agr. Vol. 19. Feb.

Aphis chaerophyllii Koch? Theobald, 1911-12.

Aphis cucumeris Forbes. Williams, 1891, p. 6.

Aphis dianthi Schrank. Walker, 1850a, p. 394.

Aphis papaveris Fab. Kaltenbach, 1874, p. 510.

Aphis rumicis Linn. Walker, 1850a, p. 19.

Myzus persicae Sulzer. Gillette and Taylor, 1908, p. 36.

Nectarophora crigeronensis Thomas. Hunter, 1901, p. 114.

Pemphigus betae Doane. Jackson, 1908, p. 218.
Pemphigus betae Doane. (populicaulis Fitch?). Clarke, 1903, p. 248.
Siphonophora pisi (Licht.) Williams. Williams, 1891, p. 6.
Smynthurodes betae Westwood. Kirkaldy, 1906, p. 9.
Trifidaphis radicicola Essig. Essig, 1912a, p. 699.

CHENOPODIUM. Goosefoot.

C. album L. Lamb's Quarters. Pigweed.
Aphis atriplicis L. (Uraphis-Hayhurstia atriplicis Del Guercio) Hayhurst, 1909b, p. 88. Theobald, 1911-12.
Aphis atriplicis L. (chenopodii Schrank). Passerini, 1863, p. 47.
Aphis chenopodii Cowen. Cowen, 1895, p. 119.
Aphis gossypii Glover (citrifolii Ashmead. In part) (citrulli Ashmead) (cucumeris Forbes) (forbesi Weed?). Pergande, 1895, p. 313.
Aphis maidiradicis Forbes. Vickery, 1910, p. 101, 103.
Aphis papaveris Fab. Kaltenbach, 1874, p. 269.
Aphis rumicis? L. (euonymi Fab.). Hayhurst, 1909, p. 98.
Myzus persicae Sulzer. Gillette and Taylor, 1908, p. 36.
Pemphigus betae Doane. Gillette, 1909a, p. 354.
Pemphigus lactucarius Pass. (Amycla fuscicornis Koch). Buckton, 3, p. 125.

C. anthelminthicum L. Wormseed.
Aphis gossypii Glover (citrifolii Ashm. In part) (citrulli Ashm.) (cucumeris Forbes) (forbesi Weed?). Pergande, 1895, p. 313.

C. hybridum L. Maple-leaved Goosefoot.
Aphis atriplicis Linn. Williams, 1891, p. 20. Theobald, 1913. Journ. Bd. Agr. Vol. 19. Feb.
Aphis rumiçis Linn. Williams, 1891, p. 20.

C. murale L.
Aphis atriplicis Linn. Davidson, 1912. p. 408.

C. polyspermum L.
Aphis atriplicis Linn. Davidson, 1912, p. 408.
Aphis atriplicis Linn. (not Buckton). Theobald, 1911-12.

C. vulvaria L.
Aphis atriplicis Linn. Theobald, 1913.

C. urbicum.
Aphis atriplicis Linn. Theobald, 1913.

C. sp.
Aphis atriplicis Linn. (A. chenopodii Cowen). Gillette, 1910, p. 405.
Aphis chenopodii Schrank. Lichtenstein, La Flore.
Aphis (Amycla) fuscicornis Koch. Kaltenbach, 1874, p. 342.
Aphis ochropus Koch. Kaltenbach, 1874, p. 505.
Aphis rumicis Linn. Thomas, 1879, p. 88.

SALSOLA. Saltwort.

S. Kali L. (Tragus). Common Saltwort.

Aphis arundinis Walker. Buckton, 2, p. 112.
Aphis rufula Walker. Walker, 1849c. p. 47.
Myzus persicae Sulzer. Gillette and Taylor, 1908, p. 35.

SPINACIA.

S. oleracea Will. Spinach.

Aphis gossypii Glover (citrifolii Ashm. in part) (citrulli Ashm.) (cucumeris Forbes) (forbesi Weed?). Pergande, 1895, p. 314.
Aphis rumicis Linn. Walker, 1850a, p. 19.

S. sp.

Aphis brassicae Linn. Lichtenstein, Flore Supplement.
Aphis papaveris Fab. Lichtenstein, Flore Supplement.
Rhopalosiphum persicae Sulzer. Lichtenstein, Flore Supplement

AMARANTHACEAE. AMARANTH FAMILY.

ACHYRANTHES.

A. sp.

Myzus achyrantes (Monell) (M. malvae Oestlund). Oestlund, 1887, p. 74.
Myzus persicae Sulzer (Siphonophora achyrantes Mon.?). Gillette and Taylor, 1908, p. 34.

ALTERNANTHERA.

A. sp.

Myzus persicae Sulzer. Gillette and Taylor, 1908, p. 35.

AMARANTHUS. Amaranth.

A. graecizans L. (albus L.) Tumble Weed.

Aphis papaveris Fab. (thlaspeos Schrk.) (aparines) (fabae Scopoli) Ferrari, 1872, p. 71.
Aphis sp. Weed. Weed, 1888, p. 125.

A. hybridus L. Green Amaranth, Pigweed.

Aphis maidi-radicis Forbes. Davis, 1909b, p. 124.

A. retroflexus L. Green Amaranth, Pigweed.

Aphis gillettei Cowen. Cowen, 1895, p. 120.
Aphis maidi-radicis Forbes. Vickery, 1910, p. 102.
Tetraneura phascoli (Pass.). Essig, 1909, p. 75.
Trifidaphis (*Pemphigus*) *radicicola* (Essig) Del Guercio. Essig 1909, p. 75.
Tychea phascoli Pass. Passerini, 1860, p. 40.

A. spinosus L. Thorny Amaranth.

Aphis maidi-radicis Forbes. Vickery, 1910, p. 102.

A. sp.

Aphis gossypii Glover (citrifolii Ashm. In part) (citrulli Ashm.) cucumeris Forbes) (forbesi Weed?). Pergande, 1895, p. 313.

Myzus achyrantes (Monell). Williams, 1891, p. 5.

Myzus persicae Sulzer. Gillette and Taylor, 1908, p. 35.

Iresine.

I. Lindeni Van Houtte (Achyranthes).

Myzus persicae Sulzer. Gillette and Taylor, 1908, p. 35.

NYCTAGINACEAE. FOUR O'CLOCK FAMILY.

BOUGAINVILLAEA.

B. brasiliensis Willd.

Aphis papaveris Fab. var. Del Guercio, 1909 (1910) Redia VII, p. 297.

OXYBAPHUS. (Allionia)

O. linearis (Pursh) Robinson. (Allionia linearis) (angustifolius).

Aphis oxybaphi Oestlund. Oestlund, 1887, p. 62.

O. nyctagineus (Michx).

Aphis oxybaphi Oestlund. Williams, 1891, p. 20.

AIZOACEAE.

MESEMBRIANTHEMUM.

M. sp.

Rhopalosiphum dianthi (Schrank) Koch (persicae, Purceron du pecher Morren) (rapae Curtis) (floris rapae Curtis) (dubia? Curtis) (vastator Smee) (persicaecola Boisduval) (persicae Pass. *not* Boyer, *not* Sulzer, *not* Kalt.). Buckton, 2, p. 17.

Rhopalosiphum persicae Sulzer. Lichtenstein, La Flore.

CARYOPHYLLACEAE. PINK FAMILY.

Arenaria.

A. peploides L.

Aphis aucta Walker. Walker, 1849c, p. 33.

CERASTIUM. Mouse-ear Chickweed.

C. arvense L. Field Mouse-ear Chickweed.

Aphis cerastii Kalt. Kaltenbach, 1874, p. 58.

C. triviale Link.

Brachycolus stellariae Hardy. (holci Hardy). Buckton, 2, p. 148.

CUCUBALUS.

C. sp.

Aphis lychnidis Linn. Lichtenstein, Flore Supplement.

DIANTHUS. Pink.

D. Caryophyllus L.

Phorodon cynoglossi Williams. Williams, 1910, p. 88.

Rhopalosiphum dianthi (Schr.) Koch. (persicae, Puceron du pecher Morren) (rapae Curtis (floris rapae Curtis) (dubia? Curtis) (vastator Smee) (persicaecola Boisduval) (R. persicae Pass.) Buckton, 2, p. 17.

Rhopalosiphum persicae (Sulzer) Pass. (dianthi Schrank) (A. vulgaris Kyber) (A. rapae Curtis) (A. dubia Curtis) (A. vastator Smee). Passerini, 1863, p. 20 and Passerini, Flora.

D. plumarius L.

Aphis subterranea Walker. (A. carotae Koch).. Buckton, 2, p. 38.

D. prolifer. See Tunica prolifera Scop.

LYCHNIS. (Agrostemma) Campion.

L. dioica L. (diurna). Red Campion.

Aphis lychnidis Linn. Buckton, 2, p. 74.

Aphis plantaginis Schrank (A. dauci Fab.). Kaltenbach, 1843, p. 59.

Aphis plantaginis Fab. Kaltenbach, 1874, p. 56.

L. divaricata Reichb. (vespertina).

Aphis lychnidis Linn. Buckton, 2, p. 74.

L. Githago L. (Agrostemma Githago L.)

Siphonophora cichorii Koch. Buckton, 1, p. 164.

L. Viscaria Linn.

Aphis lychnidis Linn. Buckton, 2, p. 74.

SILENE. Catchfly.

S. italica Pers.

Myzus lychnidis Koch (Aphis). Ferrari, 1872, p. 61.

S. latifolia (Mill.) (inflata Sm.) (cucubalus Wibel). Bladder Campion.

Anuraphis lychnidis (Linn). Del Guercio, 1909 (1910) Redia VII, p. 297.

Aphis cucubali Pass. Kaltenbach, 1874, p. 772.
Aphis silenea Ferrari. Ferrari, 1872, p. 72.
Hyalopterus melanocephalus Buck. Buckton, 2, p. 117.
Myzus lychnidis Koch (Aphis). Ferrari, 1872, p. 61.
Pemphigus inflatae Del Guercio. Del Guercio, 1909 (1910) Redia VII, p. 298.

Spergula Spurry.

S. maritima With.
Aphis cardiva Walker. Walker, 1849c, p. 32.
S. arvensis Linn. Corn Spurry.
Aphis dianthi Schrank. Walker, 1850a, p. 394.

STELLARIA. (Alsine) Chickweed.

S. aquatica (L.) Scop. (Cerastium aquaticum).
Aphis nasturtii Kalt. Kaltenbach, 1874, p. 57.
S. graminea L.
Brachycolus stellariae (Hardy) Buckton (A. holci Hardy). Buckton, 2, p. 148.
Macrosiphum stellariae Schrank. Theobald, 1911-12.
S. holostea L.
Aphis pisi Kalt. Kaltenbach, 1874, p. 60.
Brachycolus stellariae (Hardy) Buckton (A. holci Hardy). Buckton, 2, p. 148.
S. (Alsine) media (L.) Cyrill. Common Chickweed.
Aphis gossypii Glover (citrifolii Ashm. In part) (citrulli Ashm.) (cucumeris Forbes) (forbesi Weed?) Pergande, 1895, p. 313.
Myzus persicae Sulzer. Gillette and Taylor, 1908, p. 35.
S. sp.
Aphis cerastii Kalt. Kaltenbach, 1874, p. 60.

TUNICA.

T. prolifera Scop. (Dianthus prolifer.)
Aphis dianthi Schrank. Walker, 1850a, p. 394.

PORTULACACEAE. PURSLANE FAMILY.

PORTULACA. Purslane.

P. oleracea L. Common Purslane.
Aphis gossypii Glover (citrifolii Ashm. in part) (citrulli Ashm.) (cucumeris Forbes) (forbesi Weed?). Pergande, 1895, p. 313.
?*Aphis gossypii* Glover. Fullaway, 1909, p. 39.
Aphis laburni Kaltenbach. Del Guercio, 1909 (1910) Redia VII, p. 297.

Aphis maidi-radicis Forbes. Davis, 1909b, p. 124.
Aphis portulacae Pass. (Ined.) . Lichtenstein, Flore Supplement. Del Guercio, 1909 (1910) Redia VII, p. 297.
Myzus portulacae Macchiati. Macchiati, 1883, p. 280.

NYMPHAEACEAE. WATER LILY FAMILY.

NELUMBO. Sacred Bean.

N. lutea Willd. Yellow Nelumbo, Water Chinquapin.
Aphis nymphaeae Linn. Kaltenbach, 1874, p. 20.

NUPHAR.

N. luteum. See Nelumbo lutea.

NYMPHAEA. Yellow Pond Lily.

N. alba L.
Rhopalosiphum nymphaeae (Linn.) Koch. Buckton, 2, p. 13.
N. lutea.
Rhopalosiphum nympharae (L.) Koch (A. butomi Schrank) (R. najadum Koch). Passerini, 1863, p. 21.
N. odorata Dry. (Castalia)
Rhopalosiphum nymphaeae Linn. (Aphis aquaticus Jackson). Davis, 1910a, p. 245.

RANUNCULACEAE. CROWFOOT FAMILY.

ACONITUM. Aconite. Monkshood.

A. Cammarum L.
Myzus jmackianus Karsch. Karsch, 1887, p. XXI.
A. Napellus L.
Aphis napelli Schrank. Kaltenbach, 1874, p. 15.

AQUILEGIA. Columbine.

A. canadensis L. Wild Columbine.
Aphis (Adactynus) aquilegia-canadensis Raf. Rafinesque, 1817.
A. vulgaris L. Garden Columbine.
Aphis dianthi Schrank. Walker, 1850a, p. 394.
Hyalopterus aquilegiae Koch. Koch, p. 19.
Hyalopterus aquilegiae-flavus (Kittel) (Aphis) (flavus Scheuteden) (aquilegiae Koch) (trirhoda Walker). Hayhurst, 1909a, p. 112.
Hyalopterus equilegiae Koch. Koch, p. 19.
Hyalopterus aquilegiae-flavus (Kittel) (Aphis) (flavus Schouteden) (aquilegiae Koch) (trirhoda Walker). Hayhurst, 1909a, p. 112.

Hyadaphis flavus Kittel. (aquilegiae Koch) (trirhodus Walker). Schouteden, 1906a, p. 230.

Hyaloptcrus trirhoda (Walker) Pass. (H. aquilegiae Koch). Buckton, 2, p. 115.

A. sp.

Aphis malvae Walker (A. malvae Pass. *not* S. malvae Pass.) Buckton, 2, p. 43.

CALTHA. Marsh Marigold.

C. palustris L.

Aphis calthae Koch. Koch, p. 48. Theobald, 1911-12.

CLEMATIS. Virgin's Bower.

C. Flammula L.

Aphis clematidis Ferrari. Del Guercio, 1900, p. 140.

C. ligusticifolia Nutt.

Myzus varians Davidson. Davidson, 1912, p. 411.

C. recta L. (erecta.)

Aphis clematidis Koch. Kaltenbach, 1874, p. 5.

C. Vitalba L.

Aphis clematidis Koch. Kaltenbach, 1874, p. 5.

Aphis urticae Fab. (urticaria Kalt.). Ferrari, 1872, p. 65.

Aphis vitalbae Ferrari. Lichtenstein, La Flore.

C. sp.

Toxoptera clematidis Del Guercio. Phillips and Davis, 1912, p. 8.

DELPHINIUM. Larkspur.

D. sapellonis.

Aphis rociadae Cockerell. Cockerell, 1903b, p. 115.

RANUNCULUS. Crowfoot.

R. acris L. Tall Crowfoot or Buttercup.

Aphis dianthi Schrank. Walker, 1850a, p. 394.

Aphis ranunculi Kalt. Kaltenbach, 1874, p. 10.

R. bulbosus L. Bulbous Crowfoot or Buttercup.

Pemphigus ranunculi Kalt. Kaltenbach, 1874, p. 10.

Rhopalosiphum dianthi (Schrank) Koch (persicae, Puceron du pecher, Morren) (rapae Curtis) (A. floris rapae Curtis) (dubia? Curtis) (vastator Smee) (persicaecola Boisduval) (Rh. persicae Pass.) Buckton, 2, p. 17.

Rhopalosiphum persicae (Sulzer) Pass. (A. dianthi Schrank) (A. vulgaris Kyber) (A. rapae Curtis) (A. dubia Curtis) (A. vastator Smee). Passerini, 1863, p. 20.

R. californicus Benth.

Pemphigus (*californicus* Davidson) (*ranunculi* Davidson). Davidson, 1910, p. 373 and 1911, p. 414. Essig, 1912a. p. 703.

R. Flammula L. Smaller Spearwort.

Thecabius (Pemphigus) affinis Kalt. (ranunculi Kalt.). Tullgren, 1909, p. 110.

R. muricatus L.

Aphis ranunculi Kalt. Macchiati, 1883, p. 257.

R. sardous Crantz (hirsutus).

Aphis dianthi Schrank, Walker, 1850a, p. 394.

R. repens L. Creeping Buttercup.

Aphis dianthi Schrank. Walker, 1850a, p. 394.

Aphis ranunculi Kalt. Kaltenbach, 1874, p. 10.

Thecabius (Pemphigus) affinis Kalt. (ranunculi Kalt.). Tullgren, 1909, pp. 110-111.

R. sceleratus L. Cursed Crowfoot.

Rhopalosiphum nymphaeae (L.) Koch. (A. butomi Schrank) (R. najadum Koch). Passerini, 1863, p. 21.

R. velutinus Ten.

Myzus ranunculi Del Guercio. Del Guercio, 1900, p. 151.

Pemphigus ranunculi Kalt. Passerini, Flora.

Trama ranunculi Del Guercio (*radicis* Kaltenbach?) (*flavescens* Koch?) Del Guercio, 1907 (1908) Redia V, pp. 248, 344.

R. sp.

Aphis ranunculina Walker. Walker, 1852, p. 1046.

THALICTRUM. Meadow Rue.

T. minus L.

Aphis dianthi Schrank. Walker, 1850a, p. 394.

Aphis thalictri Koch. Kach, p. 81.

T. polygamum Muhl. Tall Meadow Rue.

Myzus thalictri Williams Williams, 1910, p. 69.

T. revolutum DC. (purpurascens L.)

Myzus thalictri Williams. Williams, 1891, p. 17.

Nectarophora purpurascens Oestlund. Oestlund, 1887, p. 81.

T. sp.

Aphis thalictri Koch. Kaltenbach, 1874, p. 6.

MAGNOLIACEAE. MAGNOLIA FAMILY.

LIRIODENDRON. Tulip Tree.

L. tulipifera L.

Macrosiphum liriodendri (Monell). Davis, 1909a, p. 36.

Macrosiphum liriodendri var. rufa (Monell). Davis, 1909a, p. 36.

MAGNOLIA.

M. grandiflora L.

Aphis magnoliae Macchiati. Macchiati, 1883, p. 254.

FIG. 138. A, work of *S. ulmi*, whole leaf involved. B, work of *S. ulmi*, half leaf involved. Left hand shows under surface of leaf, right hand shows upper surface. Maine specimens.

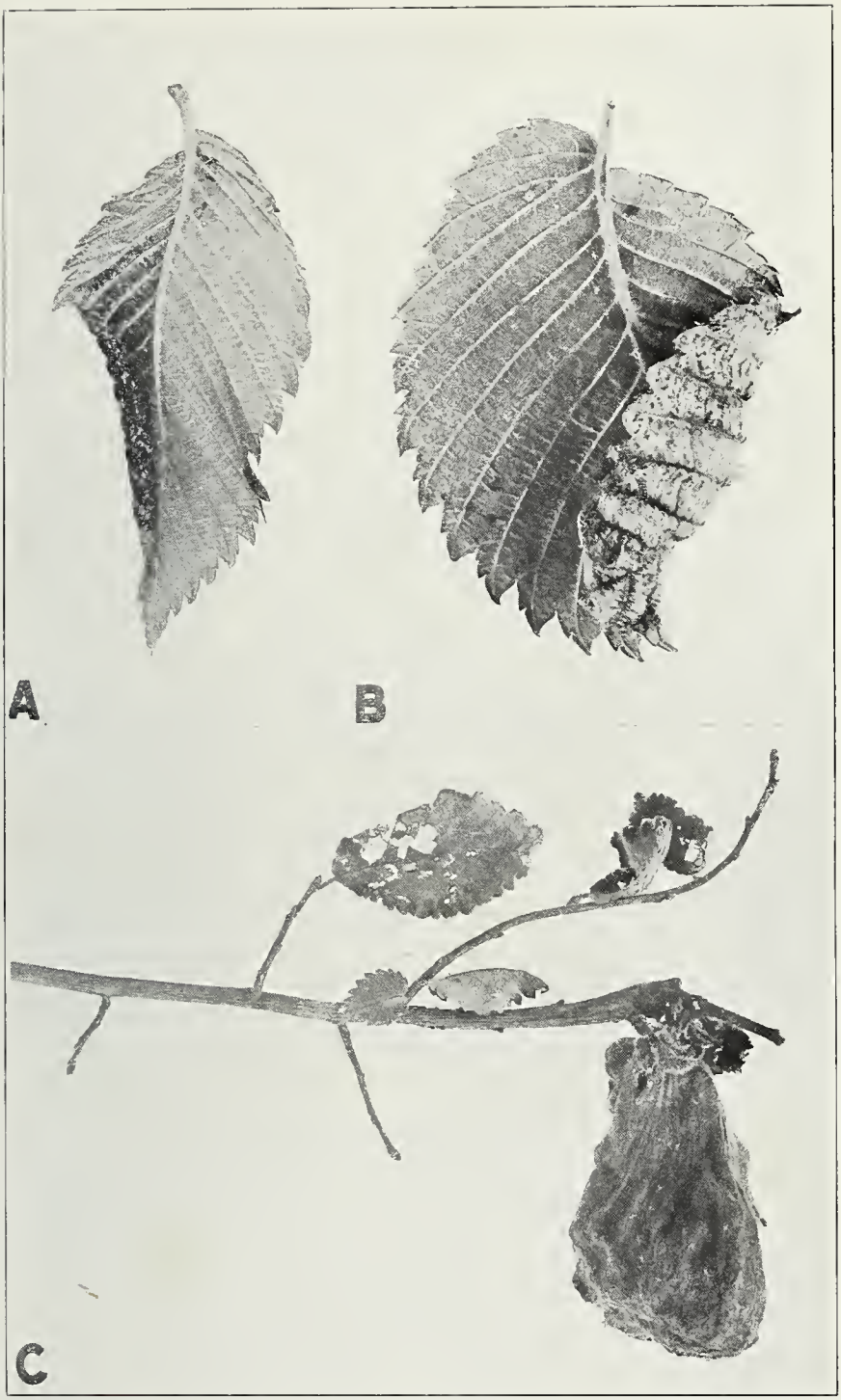

FIG. 139. A, work of *S. americana* in part of authors, young roll containing stem female. B, same species, old roll just deserted by migrants. Maine specimens. C, *S. lanuginosa*? Connecticut specimen.

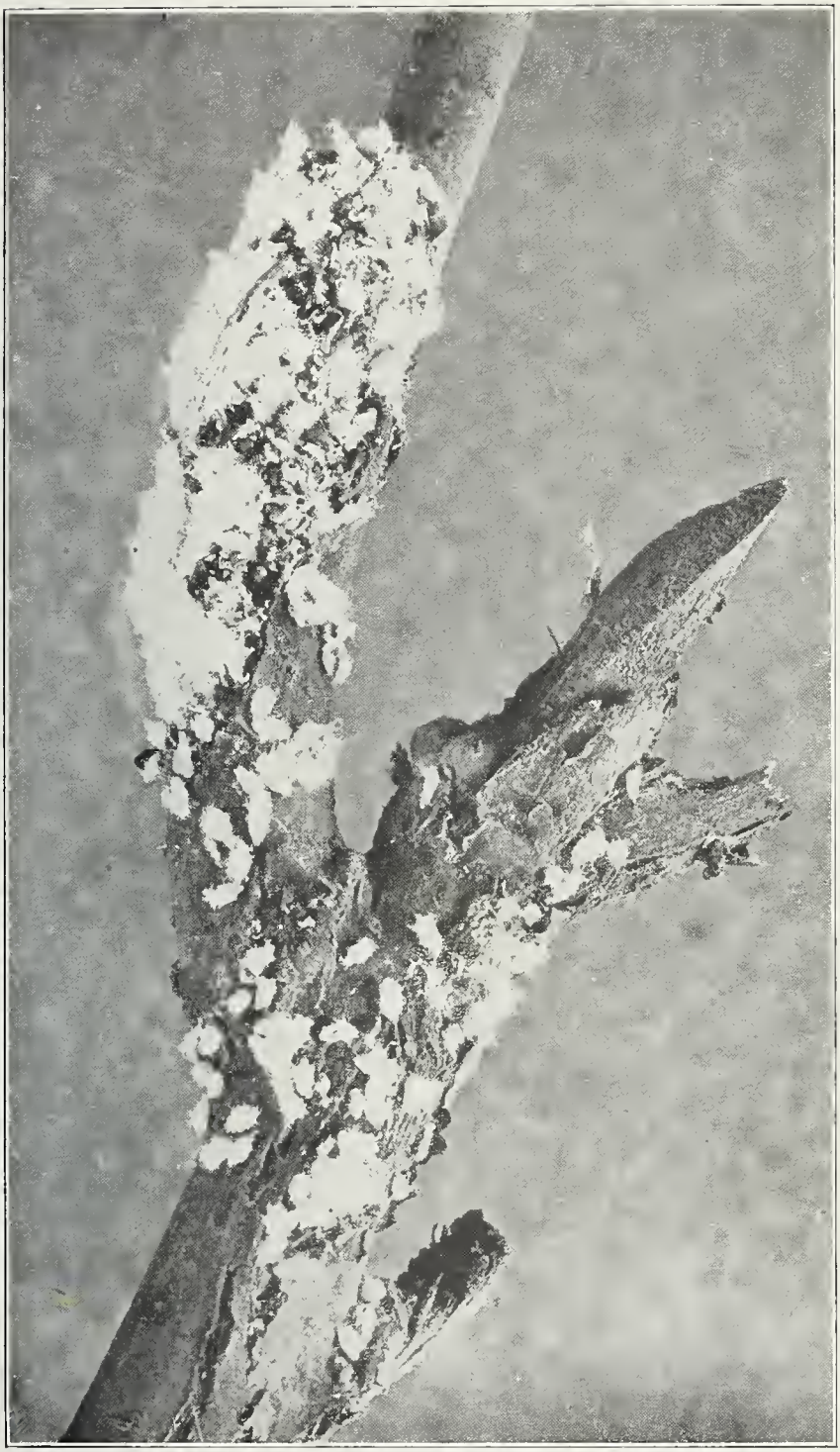

Fig. 140. *S. rileyi.*

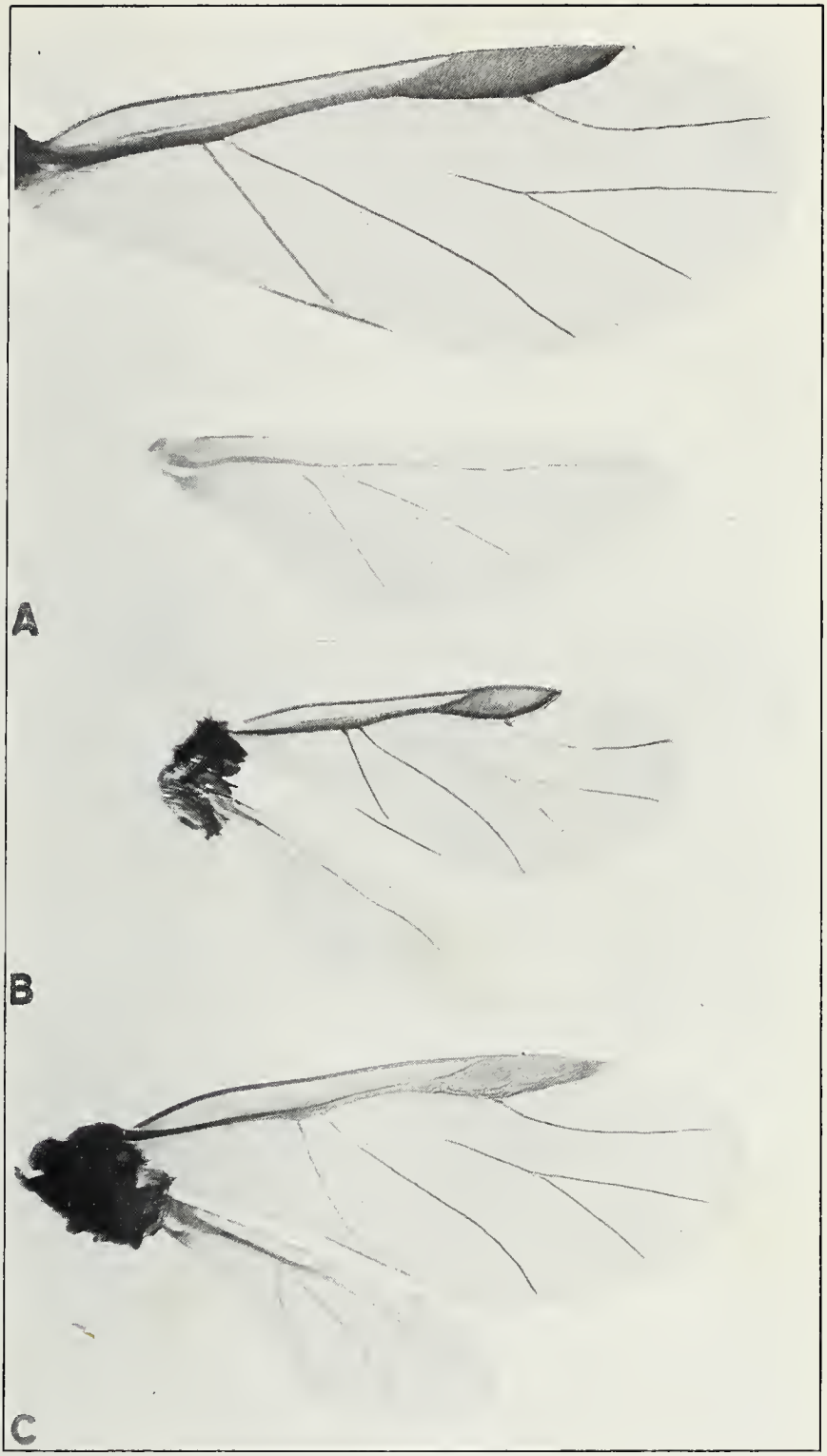

FIG. 141. A, *S. ulmi*, wings of spring migrant, (89–13). B, *S. lanigera*, wings of fall migrant (9–12 Sub. 1) reared on apple, the spring progenitors being migrants from elm leaves. C, *S. rileyi* (7–08).

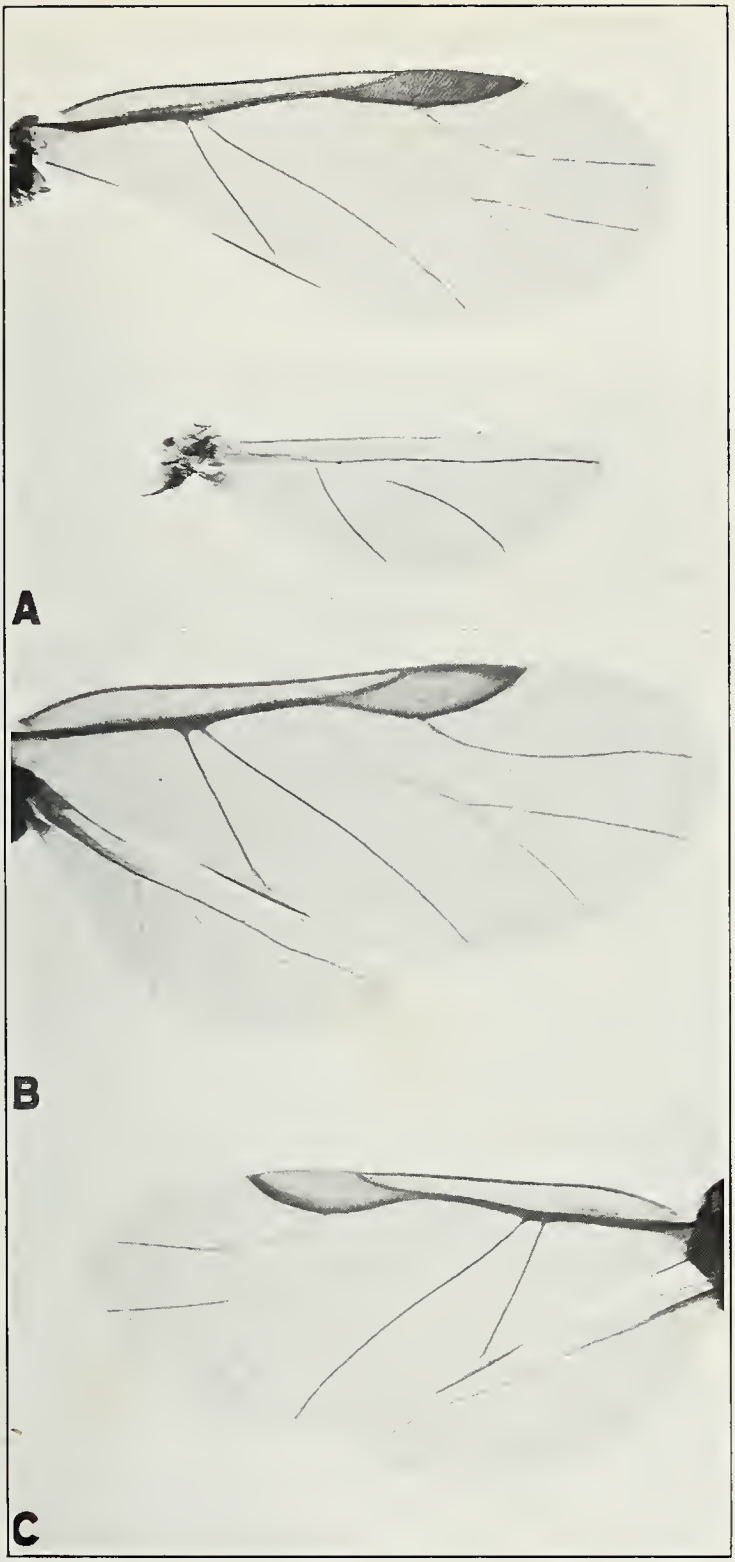

Fig. 142. A, *S. americana* in part, of authors. Wings of migrant from "roll" like Fig. 139 B. (68–13).

B, *S. lanigera* (*americana* in part of authors). Wings of spring migrant from elm "rosette" like Fig. 71 in Bulletin 217.

C, *S. lanigera* wings of fall migrant from mountain ash, *Pyrus* sp. (63–11).

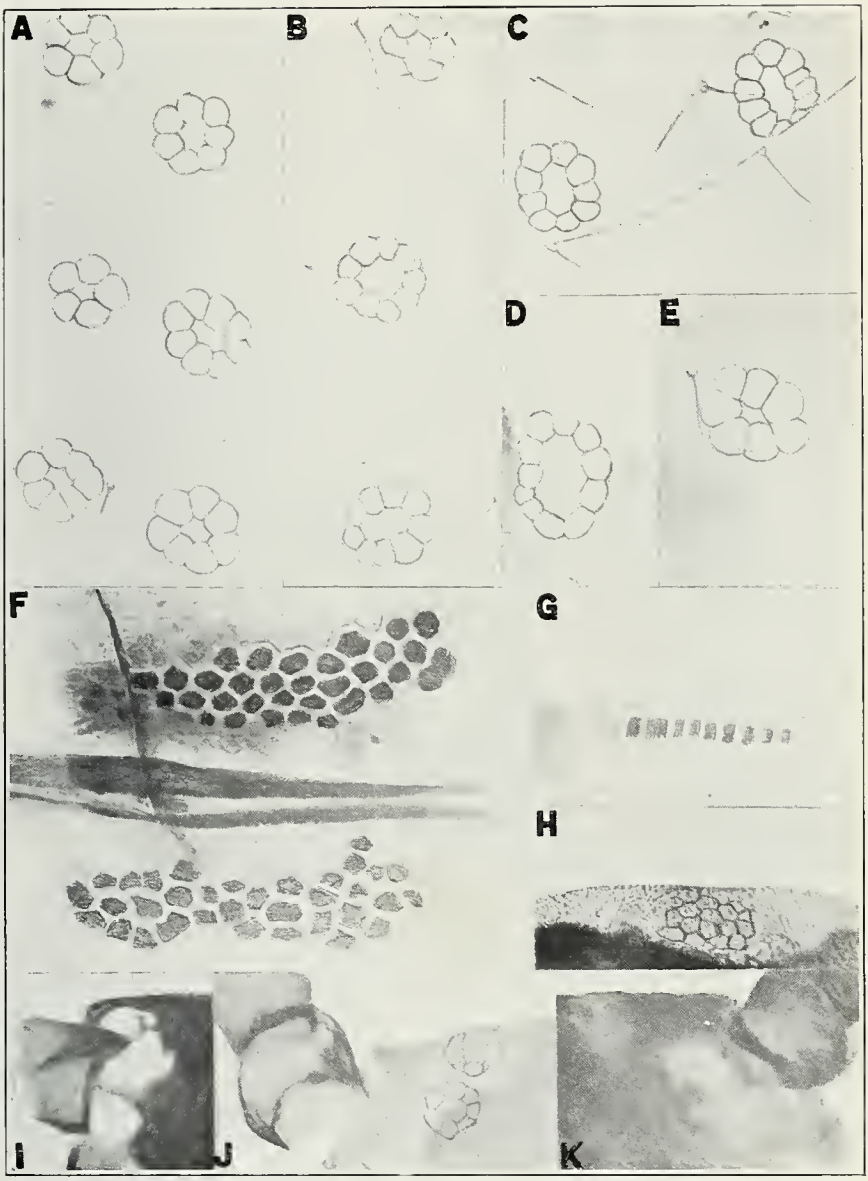

FIG. 143. Wax glands of *Schizoneura*. A–H, abdominal glands. I–K, head glands. A, *S. lanigera* (9–12) reared on apple from elm leaf progenitors. B and C, *S. rileyi*, pupal glands. D, *S. lanigera*, second generation from elm "rosette." E, *S. lanigera*, pupa from apple. F, *S. rileyi* stem female (52–13). G and H, *S. americana* in part. (20–13) wax glands of stem female from roll like Fig. 139 A. G, lateral aspect, H, dorsal aspect. I, same species as G and H stem female. J, *S. lanigera* second generation from "rosette." K, *S. lanigera* stem female from "rosette."